THE

FOUNDRY TRADE JOURNAL

WITH WHICH IS INCORPORATED

THE IRON AND STEEL TRADES JOURNAL

VOL. 49. Thursday, January 26, 1933. No. 858.

PUBLISHED WEEKLY.

Subscription Terms: 15s. per annum.
Foreign and Colonial: 17s. 6d. per annum.
All Subscriptions are payable in advance.

All Communications to be addressed to the Editor, the Advertisement Manager, or the Publisher of

THE FOUNDRY TRADE JOURNAL,
49, WELLINGTON STREET, LONDON, W.C.2.

Telegraphic Address: "Zacatecas, Rand, London."
Telephone: Temple Bar 3951 (5 lines).

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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

JANUARY 31.

Sheffield Metallurgical Association:—Ordinary meeting at Sheffield. "The Manufacture of the Mammoth Cunarder Castings," Paper by F. Swift.

Institute of British Foundrymen.

JANUARY 27.

Middlesbrough Branch:—Ordinary meeting at Middlesbrough. "The Core-Shop Mechanised," Paper by G. E. France.

JANUARY 28.

East Midlands Branch:—Ordinary meeting at Derby. "Cupola Practice," Paper by J. Cameron, J.P.

Scottish Branch:—Ordinary meeting at Edinburgh. "Sand-Testing in the Foundry," Paper by W. Y. Buchanan.

FEBRUARY 3.

Birmingham, Coventry and West Midlands Branch:—Ordinary meeting at Coventry. "The Open-Hearth Process for Steel Castings Production," Paper by W. H. Thompson.

FEBRUARY 4.

Scottish Branch:—Ordinary meeting at Glasgow. "Modern Aluminium Foundry Metallurgy," Paper by N. F. Budgen.

Lancashire Branch:—Annual dinner.

East Midlands Branch (Lincolnshire Section):—Ordinary meeting at Lincoln. "Shrinkage and Porosity in Grey Cast Iron," Paper by P. A. Russell, B.Sc.

FEBRUARY 8.

Lancashire Branch (Preston Section):—Ordinary meeting at Preston. "Coke: Its Properties and Uses," Paper by D. V. Hollingsworth.

Founding and the Steel Industry.—II.

We referred in a recent issue to some proposals by Mr. Fred Clements for the reorganisation of the British steel industry in the belief that a flourishing steel industry is very important to the foundry trade. Perhaps the most important of the proposals is one suggesting the formation of a central co-operative control company, which would, in fact, link into one body the whole of the iron and steel firms in the country, but would afford sufficient flexibility to allow for adjustment. Some of the functions of such a company as we here indicated are obvious. It would, for example, deal with all export business, maintain foreign representatives, allocate production quotas, and fix minimum selling prices in the home market.

Some of the other proposed functions of this central company deserve attention as ones which we have repeatedly urged should fall within the scope of a national manufacturers' association. The first of these is the establishment of standard methods of determining production costs. Another important one is that of central purchasing of principal raw materials. The third is the establishment of a central iron and steel research organisation controlled by the industry and supported by a levy on production, but formed as an independent organisation. This is already in existence as the Iron and Steel Industrial Research Council of the National Federation of Iron and Steel Manufacturers.

Another important point is the establishment of procedure by which the best trained men passing out of the universities and technical schools could be absorbed into the industry, and finally there is the important work of accelerating the co-ordination of specifications, particularly the national specifications of the British Standards Institution, and the formulation of other specifications which would cover all reasonable steel requirements. In addition to the above, the suggestion is also made that fresh negotiations should be opened with various workers' organisations with a view to finding out how far the workers are prepared to go in solving the unemployment problem and in removing some of the labour obstacles to cheap production.

The difficulties of dealing with the founding industry on lines which can be dealt with by a comparatively small group of the large steel firms are almost insuperable, but several of the above suggestions could be profitably worked out by the founding industry if it had a group of fully representative manufacturers' associations to deal with them.

Fireproof Ships.

The disaster which overtook "L'Atlantique" has brought very much to the fore the question of fireproof ships. The all-steel ship, apart from the all-important humanitarian aspect, is not ruled out of practical politics either by difficulties of construction or the provision of a maximum of comfort. So far as construction is concerned, the liberal use of aluminium-alloy castings for doors, lavatory seats, banisters, stairs, and a hundred other components. The construction of partitions between the cabins could very well be made of a double-steel sheeting, with the interspace filled with some material like asbestos or kieselguhr. This type of construction gives a quantity of work to the foundry by way of the provision of metallurgical castings, such as ingot moulds, furnace doors and the like, rolls and rolling-mill castings and those incorporated in sheet-metal-working machinery such as presses and guillotine shears. An added precaution would be the greater use of vitreous enamelling as the painted variety makes good fuel in case of serious fire. Whilst the properties of steel are vastly different from those of wood in the direction of heat and sound conductivity, yet by incorporating modern methods of construction they can be emulated. Any attempt to make conditions aboard ship "homelike" should be discouraged. They are a poor imitation at best. Effort should be concentrated on making them hygienic, well ventilated and warmed or cooled. In other words, for the sake of safety, ships should resemble the hospital rather than the home. It is hoped that the appropriate business and industrial organisations will make representations to the authorities to alter so the design, construction and equipment of British ships so as to reduce the fire risks to negligible proportions.

Spelter Uncertainties.

BY "ONLOOKER."

For some months past spelter has been regarded as the most promising of the non-ferrous metal group, for the control exercised by the Cartel and the knowledge that stocks were being brought down operated to promote optimism as to the future and encouraged the idea that at £15 this metal was certainly not over-priced. Worked back on to a gold basis, the valuation is certainly not a high one, the equivalent being about £10 per ton, and profits for even the most favourably placed companies cannot be anything but meagre, but nevertheless there are signs that some members of the Cartel are getting restless under restriction, and that they consider the time is now ripe to expand production. Stocks, it is true, have been brought down very considerably in certain directions, but, judging by the amount of spelter available in this country, we are a long way from a famine, and one certainly cannot imagine consumers being stampeded into a rush for metal.

It is now nearly a year since the duty was applied to foreign spelter, and the tonnage which was rushed into this country at that time to anticipate the tax has been practically exhausted, as a result of which the Empire producers have found it possible to increase their premiums. This, at any rate, is the generally accepted explanation of the increased cost to the consumer of electrolytic and prime western zinc of Canadian and Australian origin, but inasmuch as Continental countries appear to be paying very similar prices, it seems a little doubtful whether this deduction is quite accurate. It is, of course, a fact that at ruling values the duty on foreign spelter amounts to nearly 30s. per ton, and this is obviously an umbrella for those producers who, so to speak, have this market in their pockets, but in the present temper of consumers, and bearing in mind the conferences which have taken place in regard to the quotations for lead and copper, it would appear to be advisable for the Empire spelter people to tread warily.

The reaction in values seen early in January showed two things—(1) that spelter is vulnerable to any hint that the grip on output curtailment may be relaxed, and (2) that consumers are not very well bought and are prepared to place orders on any setback in the quotation. There was, as a matter of fact, quite an encouraging influx of orders, but the movement did not develop into anything big, and it is fairly evident that users have not sufficient faith in the outlook to go very far ahead at current rates. Their policy is probably one of covering sales, but not of getting additional length by making purchases in anticipation of future needs, and in acting thus they appear to be wise, for the spelter outlook is decidedly uncertain. The concluding months of last year saw something of a slump in demand from the East, both for spelter and for yellow metal, in the manufacture of which zinc plays an important rôle. It is satisfactory to be able to report that some improvement has taken place, but in these days of preferential tariffs it frequently happens that additional business in one country is secured at the expense of another, and that, therefore, no additional demand occurs as far as the world position of a commodity is concerned. This is probably true of spelter at the present time, and it is an aspect of the case which should be carefully watched by consumers in this country.

All things considered, it is perhaps unlikely that any great reaction in zinc values will be seen, for producers know from bitter experience that it is very much easier to let values fall than to get them up again, and that, once faith is shaken, it is far from easy to restore confidence again. By patient endeavour and sound co-operation, the members of the Zinc Cartel have, during the past nine months or so, put their house in order and raised the reputation of their product from the ignominy of ranking as the Cinderella of the metal markets to a position in which it has been held up as a pattern for the other members of the non-ferrous group to follow. Far from standing at a discount below lead, it has assumed its rightful place as higher in value, and now boasts a premium of about £4 above that metal. Is all this to be thrown away by an injudicious and precipitate increase in the rate of production? In the interests of all concerned, it is to be hoped that no such ill-advised steps will be taken.

Heat-Treatment of Chrome Magnet Steels.

The magnetic properties of steels containing 2 per cent. Cr and 1 per cent. C are very sensitive to variations in heat-treatment, especially in regard to prolonged heating at the hardening temperature. This has been examined at the Metal Research Institute, Leningrad, by W. S. MESSKIN and E. S. TOWPENJEZ, who further tried to find means of restoring steel which had been subjected to faulty treatment. Their report appeared in a recent issue of "Archiv für das Eisenhüttenwesen."

Their tests were made on an open-hearth steel containing 1.33 per cent. C, 0.37 per cent. Si, 0.55 per cent. Mn, 0.048 per cent. P, 0.033 per cent. S, 2.15 per cent. Cr and 0.065 per cent. Ni. The steel was rolled into bars 30 mm. sq., the initial rolling temperature being 1,050 to 1,100 deg. C. and the final heat 850 to 870 deg. C. The rolled bars were annealed at 850 deg. C., and cooled down in the furnace. The electrical and magnetic properties were measured on pieces 8 mm. sq. by 300 mm. long, cut from the bars. These were heated to temperatures from 750 deg. to 900 deg. C. in an electrical furnace in a lead bath and quenched in oil. The tests showed that the coercive force reached its maximum value on hardening from 825 deg. C., remaining constant over the range up to 900 deg. C., showing that the steel was not so sensitive in this respect as previously assumed. The same applied to the other properties, the best results, with due regard to the effect of ageing, being obtained by hardening at 850 deg. C., this temperature being held for 5 min. The curves of Rockwell hardness and electrical resistance showed a distinct kink at this temperature, being fairly constant between 825 deg. and 850 deg. C., after which both rose sharply.

Specimens annealed at different temperatures, from 650 deg. to 1,100 deg. C., before hardening, showed that the magnetic properties were impaired by holding too long at temperatures between 750 deg. and 850 deg. C. At 950 deg. C. the coercive force increased with the duration of the annealing period up to three hours, at which time it had not yet reached its maximum. Higher values were obtained by annealing at 1,000 deg. C., but these were very sensitive in regard to the annealing time, reaching a maximum at half an hour. The conclusion drawn is that to restore a steel damaged by wrong heat-treatment it should be held at 950 deg. to 1,000 deg. C. for about 30 min. to an hour and then cooled in air, followed by the usual hardening treatment from 850 deg. C. after holding for 5 min. If the steel be overheated in the normalising process it should be tempered at 150 deg. to 250 deg. C. before hardening.

The tests confirmed former results in that there is no definite relationship between the coercive force and the hardness, and that measurement of the maximum induction may be substituted for measurement of the maximum saturation in investigating the effects of annealing hardened steels.

THE MATTER on page 36 was not a continuation of Mr. Player's article on the Light Alloy Foundry Trade, but a continuation of Mr. Stobie's Review of the Institute of British Foundrymen.

Spalling of Bricks.

Coarse-grained bricks tend to spall less than those of fine grain, states a short article in "Blast Furnace and Steel Plant," and some users contend that porous bricks are less liable to the trouble than dense bricks. It is possible, however, under some conditions for porosity to promote spalling. With silica bricks a porosity of about 28 to 30 per cent. is recommended. The volume changes producing this defect may be either permanent or reversible expansions, positive or negative. For example, an underburned fire-clay brick which usually shrinks on further heating may spall by reason of this shrinkage. Hard burning, on the other hand, may produce an inelastic bond which cracks under reversible expansions. The volume changes which occur in silica products have a direct bearing on spalling.

Tests for spalling have a somewhat limited application, as the conditions of service differ so considerably. According to Norton, other things being equal, the tendency of a brick to spall is proportionate to the coefficient of linear expansion, and this coefficient in most cases varies with the temperature at which spalling occurs. Between 300 deg. and 700 deg. C. the strains are most pronounced, and it is in this range that spalling occurs. Above 700 deg. plastic flow is common. The materials which readily spall include silica, siliceous insulating bricks, magnesite, and chromite. The most resistant are zircon, silicon-carbide, kaolin, mullite and alumina. The fire-clay products fall between these two extremes.

Amalgamation of Japanese Iron and Steel Works.

During the coming session of the Imperial Japanese Diet, the Minister for Commerce and Industry is to present a Bill enforcing the amalgamation of iron and steel works in Japan. It is contended that too many producers are operating, resulting in heavy losses and uneconomic competition, as well as hindering the rational development of the industry. The first step is the amalgamation of the five large ironworks, to be followed by that of seven steelworks, with the Seitetsusho as a nucleus. The present capacity of these works totals 1,350,000 tons of pig-iron and 1,600,000 tons of steel per annum. A new holding company is to be formed with a capital of 40 million yen yielding a fixed interest of 6 per cent., any excess profits to be applied to reducing the costs of production. The Government will also make the company a loan of 70 million yen at the same terms as the previous loan to the Seitetsusho, viz., the carrying of a stock of 1,500,000 tons of ore per annum and a study of the manufacture of arms and military material. The company is to be virtually under Government control.

Iron Industry Pioneer.—The work of restoring the monument and grave of Dr. John Roebuck in Carriden Churchyard, Bo'ness, has now been completed by his descendents and the Carron Company. Dr. Roebuck was a pioneer of the iron industry in Scotland, and one of the founders in 1759 of the famous Carron Iron Works.

Copper and Nickel Production in Canada in October, 1932.—The Dominion Bureau of Statistics at Ottawa reports that in October 22,587,353 lbs. of copper were produced, as compared with 18,811,514 lbs. in September and 22,694,769 lbs. in October, 1931. During the ten months ended October 31. output reached 206,964 843 lbs., a decline of 15.9 per cent. during the year.

Nickel production during the month totalled 2,141,168 lbs., as compared with 677,998 lbs. in September and 3,096,300 lbs. in October, 1931. For the first ten months of the year output totalled 27,781,675 lbs., as compared with 58,749,868 lbs. for the corresponding period last year.

The Foundry Industry of Czecho-Slovakia.

By Prof. Dr. Mont. Fr. Pisek.

(*Concluded from page 40.*)

At Vítkovice there are two blast-furnace plants and five furnaces. The average daily production of four of these five blast furnaces is from 500 to 600 tons pig-iron daily. Different kinds of pig-iron are produced—basic, foundry with 0.8 per cent. P, hematite, spiegel and ferro-manganese. The iron ores come mainly from the corporation's own iron mines in Sweden, and only a small part from Slovakia; whilst the coke is produced in their own ovens.

The modern dry coke-cooling plant installed there is very interesting. Of the Sulzer type, it is erected at the Caroline Pit and comprises 75 ovens and quenches 750 tons of coke per day by a neutral gas, which generates 500 kg. steam at a pressure of 18 atmospheres at 350 deg. C. per ton of coke.

An additional interesting feature is the system employed for the economic utilisation of gas. The blast-furnace plants are connected by a pipe line to a 50,000 cub. ft. gasometer. The coke ovens also accumulate their gas in a smaller gasometer. The gases, alone or mixed, are employed for heating the different metallurgical furnaces and for the gas engine. The whole of this gas system is controlled from a central station. The blast furnaces are equipped with an electric gas-cleaning plant, the first in the world to be installed.

Czecho-Slovakia's Largest Foundry.

The grey-iron foundry of the Vítkovice ironworks is the largest in the Czecho-Slovakian Republic. It has 4 hectares of buildings surface and produces castings ranging in weight from a pound to 100 tons. The foundry is divided into four sections:—(1) small castings, (2) medium and engineering castings, (3) heavy castings, and (4) pipes. The section for small castings is equipped with a ton-per-hour cupola and melts metal for castings up to a hundredweight. The section for medium and engineering castings measures 500 ft. long by 115 ft. wide, is divided into a large bay for moulding heavy castings and two side bays for medium castings. This section is fitted up with a melting plant comprising 7 cupolas having a melting capacity of 4½ to 7 tons per hr. The bay for heavy castings is housed in a building 328 ft. long by 65 ft. wide, equipped with 4 cupolas having a melting capacity of 12 tons per hr. each, supplemented by two 35-ton air furnaces. In this section they have turned out some of the heaviest ingot moulds weighing up to 80 tons; heavy-machinery castings up to 100 tons and rolls of 70 tons weight. The pipe foundry is the largest in Czecho-Slovakia. It is situated in two large buildings and fitted up with four "Ardelt" turntables. A large pattern shop, 328 ft. long by 107 ft. wide completes the foundry department.

Fig. 5 shows the equipment of the pipe foundry with revolving "Ardelt" machines; Fig. 6 shows a view in the heavy bay; Fig. 7 shows a section equipped for semi-automatic mass production, whilst Figs. 8 and 9 show typical heavy castings produced in the foundries of Vítkovice. The annual capacity of these foundries amounts to 45,000 tons of castings, that is 35 tons per workman yearly. The Corporation possesses two steel plants from one of which, the so-called "new" open-hearth plant, produces about 700,000 tons of ingots yearly. This "new" open-hearth plant is equipped by two stationary open-hearth furnaces of 60 tons capacity each, and four open-hearth furnaces of 150 to 200 tons each.

The "old" open-hearth plant is equipped for the production of both forgings and steel castings and has an annual capacity of 120,000 tons yearly, of which 9,600 represent the latter. The weight of the individual steel castings varies between 8 ozs. and 80 tons. This foundry is well known by all the large shipbuilding concerns as supplying high-grade stern posts, propeller brackets, rudders, and the like.

The Czecho-Slovak Mining & Iron Works Company.

This is one of the largest Czecho-Slovakian iron and steel concerns owning large coal mines and coking plants. The largest of all its mines is the "Ignat" pit at Moravská Ostrava, which sends the whole of its output to the Ignat coking plant. In this plant about 460,000 tons of coke are produced yearly, whilst no less than 550 workmen are employed. Adjoining the coking plant is the by-products plant for recovering ammonium sulphate, tar, pitch, ammonia, benzol, naphthalene and phenol. The coke-oven gas is either used for heating boilers in the large electric plant situated near the coking plant or for heating the coke ovens or for manufacturing ammonia liquor from atmospheric nitrogen in the adjoining works of the Czecho-Slovak Nitrous Products Company, in which the Czecho-Slovak Mining & Iron Works Company hold shares. The chief works of the company are the ironworks in Trinec.

These ironworks, which have been modernised in the course of the last ten years, are composed of the following departments: blast furnaces; steelworks; foundries; rolling mills; coking plant with by-products recovery plant; copper-recovering plant and a number of auxiliary departments. Pig-iron is manufactured in four modern blast furnaces. The output of the largest is 650 tons in 24 hrs., its height being 100 ft.

The blast furnaces smelt ores from nearly all over Europe and produced in 1929 470,000 tons of pig-iron, the fine ores being sintered. The capacity of the ore stock yard is of the order of 330,000 tons. Steel is manufactured in two separate steel plants, the total output being in 1929, 500,000 tons in ingot form. No. 1 steel plant has six fixed open-hearth furnaces of a capacity of 35 tons, and one tilting Wellmann furnace of a capacity of 75 tons. No. 2 steel plant, serving mainly for the manufacturing of high-quality steel, has six fixed open-hearth furnaces of a capacity of 35 to 15 tons and one special 5-ton Bosshardt open-hearth furnace.

There are both steel and grey-iron foundries. The steel foundry, which takes molten metal from No. 1 steel plant, is well equipped and produces all kinds of steel castings weighing anything from a pound to 20 tons. The annual output is 4,000 castings (Fig. 10).

The grey-iron foundry is divided into three departments: heavy castings up to 18 tons; a foundry for small castings of a weight varying from ozs. to a ton, and a brass foundry. The foundry uses four cupolas and three air furnaces, fired by coal, by pulverised fuel, and a third by fuel oil. The annual output of the cast-iron foundry is about 18,000 tons yearly. The speciality of the foundry is the casting of rolls. It is illustrated in Fig. 11.

The rolling mills of Trinec are of modern construction The continuous output of the mill for billets from the ingots constitutes a record

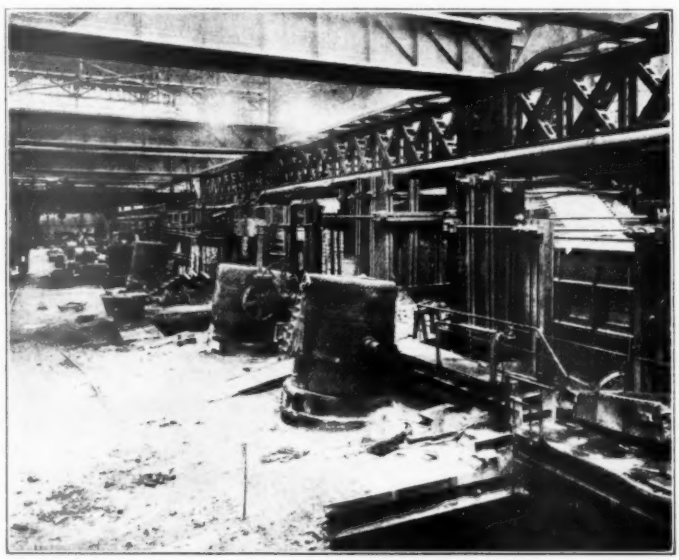


FIG. 14.—OPEN-HEARTH PLANT IN THE SKODA STEEL FOUNDRY AT PILSEN.

FIG. 15.—CAST-STEEL FRAME MADE IN THREE PARTS BY SKODA AT THEIR PILSEN WORKS.

throughout the whole continent. The annual output of these rolling mills in 1929 was about 700,000 tons rolled products. The total number of workmen employed at Trinec is about 5,000 in normal times. Moreover, the company also possesses sheet-rolling mills at Karlova Hut.

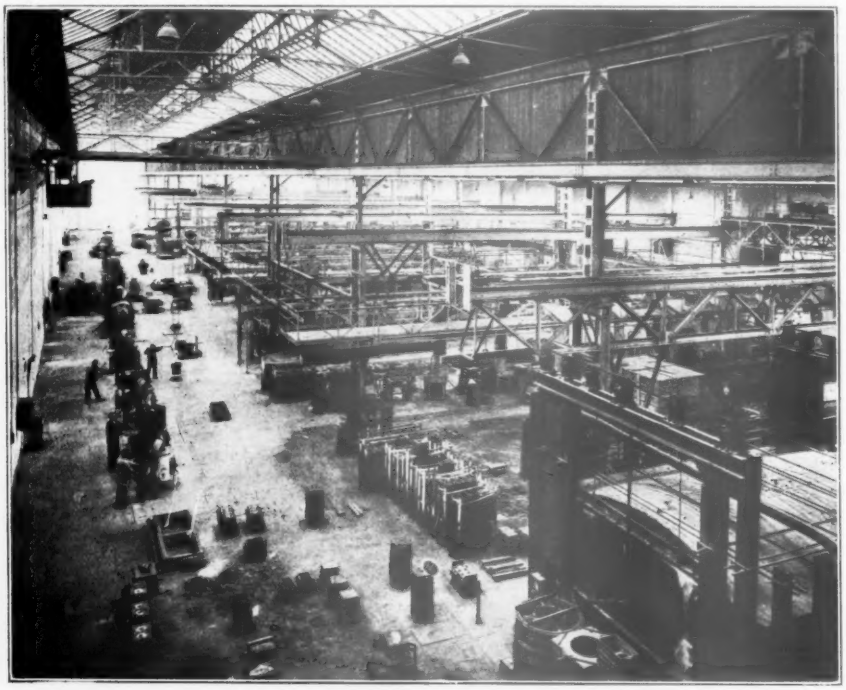


Fig. 16.—Part of the Skoda Non-ferrous Foundry, showing Melting Plant.

near Moravská Ostrava, which are the largest of their kind in Europe.

The foundry coke is produced in Moravská Ostrava at the coke plant at the Caroline pit, at Ignat and at Frantisek.

"Frantisek" Coke Plant.

This coke plant produces high-quality coke both for blast furnaces and for foundry uses: its high resistance to compression and its low sulphur content are worthy of note. The foundry coke contains: Moisture, 1.1 per cent.; ash, 10.5 to 11; fixed carbon, 87; total sulphur, 0.7 to 0.75, and combustible sulphur, 0.52 per cent. Its calorific value is about 7,150 calories.

The foundry coke is produced from rammed coal, whereby a dense structure is obtained; its porosity amounts to only about 41 per cent.: it is of light grey colour, having silvery lustre, and has a compressive strength of 200 to 300 kg. per sq. cm. Its strength according to the Simmerbach method is: Lump coke, over 40 mm., 86.4 per cent.; 10 to 40 mm., 10.4; under 10 mm., 3.2; American shatter test: over 50 mm., 90 per cent.

The most recent battery of the Frantisek coke plant is of the Still type, built in 1929. This battery of 50 ovens is of the multi-stage combustion system type for heating with rich and poor gas and for rammed coal. The capacity of the battery is 540 to 570 tons per day.

The production of by-products is, normally, 2 per cent. of tar, 0.96 per cent. of sulphate of ammonia and 0.69 per cent. of benzol, related to the dry-coal charge. The market for this foundry coke reaches out to Danzig, Lodz, Warsaw, Salzburg, Bulgaria and Bessarabia. All the by-products of the coke manufacture in the district of Moravskà Ostrava, except the ammonium sulphate and concentrated ammonia liquor are sent in the crude state to the Rütgers factory at Zábreh, near Vítkovice.

Brno or Brunn.

Brno is the second largest town of the Republic, with more than 250,000 inhabitants, and is an ancient seat of the foundry industry. In the surrounding district of Brno ore was mined in times long past, and thus gave rise to some small blast furnaces. At the end of the last century, the ore mines, because of the low content of iron, were abandoned, and the only large establishment existing at this time; the Blansko Company, 30 km. from Brno, was changed into a foundry. These works, which are counted among the oldest smelting works in the Republic, are owned by Ceskomoravská-Kolben-Danek, of Prague. Blansko chiefly produces commercial castings, pipes, radiators, enamelled-bath tubs and art castings. The products of the Blansko works have a very good reputation and are exported all over the world. Blansko has exported its castings to Russia, Asia and even to America for more than a hundred years.

In the town of Brno itself there are two large unattached foundries. "Uxa Brothers," who manufacture light engineer's castings for automobile industry and malleable castings, normally they employ about 250 workmen. The second is "Ignat Storek," which manufactures light-iron, light-steel and malleable castings. There is attached to this foundry an engineering department, producing water turbines of the "Kaplan" type.

The two largest engineering companies in Brno are the První brnenská strojírenská spolecnost; the Brunn Turbine & Equipment Company and Brno-Královopolská stropírna, the Brno-Královo Polè Engineering & Railway Carriage Works, Limited. The first of these establishments, known the world through for its steam turbines, employs in its foundry about 200 workmen, and produces the largest types of castings for its own use. The annual output in the year 1929 was about 5,000 tons.

The second of these companies, making chiefly wagons and installations for naphtha refinery, has a new grey-iron and non-ferrous metal foundry for all kinds of castings. The number of workmen in the foundry is about 200 and the annual output is about 4,000 tons yearly. The total number of workmen is about 2,000.

The surroundings of Brno are of great historic interest. In the centre of the town is situated the Spilberg hill, surmounted by an old fortress, where the Austrian Italians were imprisoned on account of their sympathies towards Italy. Half-an-hour by train, one reaches Slavkov, or Austerlitz, the battleground of the three emperors. Near Blansko is situated the Moravian Karst, with its "Macocha" chasm and its world-renowned caverns. These extend for several kilometres.

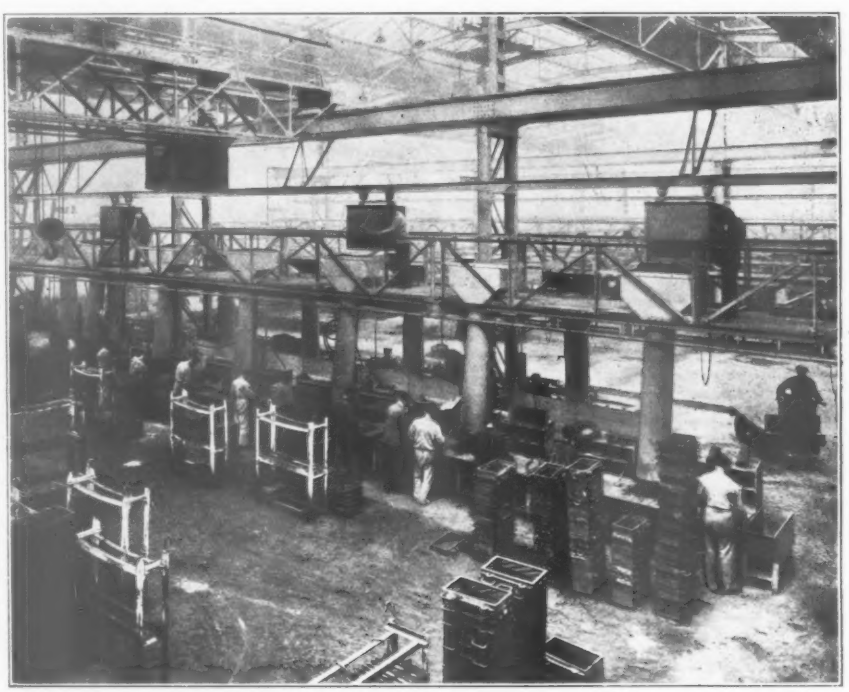


Fig. 17.—Bench Moulding Plant at the Skoda Non-ferrous Foundry, Pilsen.

Pilsen.

Plzen is known everywhere as the location of the Skoda works. The Skoda works are the greatest engineering concern in the Republic. After the Great War the works, which until then were almost exclusively engaged upon the manufacture of guns and ammunition, developed at a rapid rate by the acquisition of a number of large engineering works. To-day these works own, beyond the main works in Plzen, coal mines, steelworks and rolling mills at Hrádek, near Plzen, engineering works at Prague-Smíchov, which produces steam and Diesel engines, engineering works at Hradec Králové, producing boilers, and machinery for sugar factories, breweries and distilleries; the shipyards at Komárno on the Danube, electrical engineering works at Brno, automobile factory in Mladá Boleslav. The Skoda works also participate in other industries.

The Skoda works normally employs about 35,000 people. The most interesting from the foundry point of view are those at Pilsen. The grey-iron foundry is, in area and capacity, one of the largest engineering foundries on the Continent. Its lay-out is shown in Fig. 12. It is divided by a main cross conveying line into a section for heavy and medium castings for engineering purposes, and into a section for small castings. The melting plant comprised six cupolas of 24-in. to 64-in. internal diameter and one 4-ton electric-arc furnace, producing the molten grey iron for automobile cylinder blocks. All the cupola furnaces are provided with forehearths.

The core-making plant is provided with modern machinery and conveying equipment. For the small castings all kinds of moulding machines are used, and the sand is delivered to each machine by means of an overhead conveyor. The moulding surface of this foundry is about 5,650 square metres, and the annual capacity is of the order of 15,000 tons of castings. For the manufacture of alloy cast iron, ferilite, titanite, neochrome and ferochromit, this foundry is fitted up with oil-fired furnaces.

The Skoda Steel Foundry.

The lay-out of this foundry is shown in Fig. 13. It produces ingots for both the forge and rolling mills and also steel castings up to the weight of 80 tons. The ordinary steel is made in basic furnaces, but steel of higher quality is generally produced in acid furnaces. The process of melting takes place in six fixed Siemens-Martin open-hearth of a capacity of 260 tons each (Fig. 14) and in an electric-arc furnace of 6 tons capacity. An electric-steel foundry is attached to the large steel foundry and is furnished with liquid metal by two electric-arc furnaces of 10 tons and 6 tons capacity.

The moulding floor of the large foundry is about 5,500 square metres and that of the electric-steel foundry about 1,550 square metres. The annual output of the large foundry is about 16,000 tons of ordinary steel castings and 5,000 tons of electric steel castings (Fig. 15). In 1929 the steelworks produced 16,000 tons of finished castings, 77,000 tons of basic ingots, 19,000 tons of acid ingots and 2,600 tons of electric ingot steel. All special ingots are treated by the Harmet process in a hydraulic press, the maximum pressure of which is 100,000 tons.

The Skoda Non-Ferrous Metal Foundry.

This is housed in a rectangular building 476 ft. long by 208 ft. wide, and was installed in 1929. Along the whole length of one of the longitudinal walls are situated the stores of metals, refractory materials and melting crucibles. Two views of it are given in Figs. 16 and 17. Parallel to the stores is situated the melting floor, served by two cranes. Bronze and brass are melted down in furnaces of various types, including crucible and non-crucible, heated either by electricity or by gas. The total capacity of the furnaces is about 4.5 tons. Aluminium and light alloys are melted in gas-fired crucible or pot furnaces; their total capacity is 1.2 tons. The annual output of the non-ferrous metal foundry is 1,500 tons of bronze and brass castings and ingots and 500 tons of light-alloy castings.

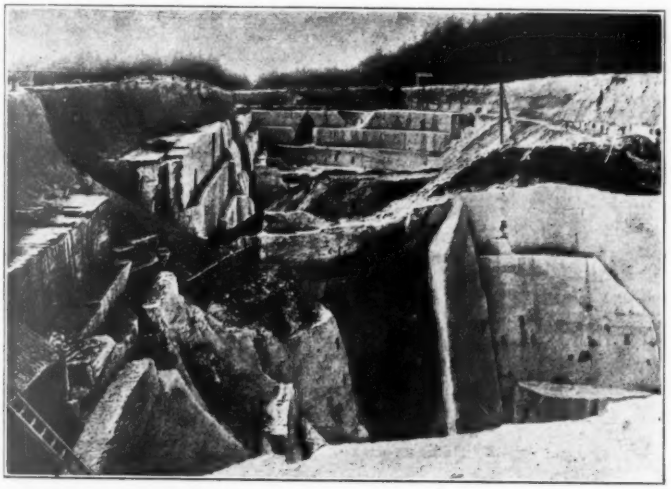


FIG. 18.—VIEW IN THE KAOLIN MINES OF THE HORNI BRIZA.

Refractory Manufactures.

In the neighbourhood of Plzen, at Horní Bríza, are situated world-renowned Západoceské kaolinové závody (West-Bohemian Kaoline Works), the largest factory for refractory material in the Republic, producing all kinds of refractory materials and the best type of dinas bricks. On the property of the Works enormous deposits of kaoline are found, probably the largest on the Continent (60 m.). In one year the works won approximately 4,500 wagons of washed kaoline.

Besides these Kaoline deposits, the Works possesses a range of fire clays in the other districts of the Republic; they employ in all their various works, in normal times, about 3,000 operatives.

Of great interest for foundrymen, who gain their bread by the sweat of their brow, will be the visit of the well-known Municipal Brewery at Plzen, where it will be possible to indulge in "Prazdroj" or "Urquell." This is the home of that golden-yellow, sparkling and foaming lager beer which has created the reputation of Pilsen's greatest industry. The Municipal Brewery is the largest in Czecho-Slovokia. Its pre-war annual output reached the not inconsiderable quantity of one million hectolitres. The production in 1930 amounted to 900,000 hectolitres or 20 million gallons.

Among the other important industrial works of general interest which will be visited by the delegates will be the well-known Bata Shoe works at Zlín, the reputation of which is such as to make any further recommendation needless. These works which also have grey-iron and steel foundries for their own use are based on the latest rationalised principles, which the late owner brought by his management to such a great success; they manufacture about 150,000 pairs of shoes daily. Upon the termination of the congress, the delegates will have the opportunity without much inconvenience and loss of time to visit the famous Czecho-Slovak watering places of Karlovy Vary (Karlsbad), Mariánské Lázne (Marienbad) and Jáchymov (Joachimsthal).

For still further details of the Czecho-Slovakian foundry industry readers are referred to an article by the author which appeared in THE FOUNDRY TRADE JOURNAL, Vol. 39, Nos. 627 and 628.

British Thomson-Houston Activities.

The larger contracts completed or in course of execution by the British Thomson-Houston Company, Limited, during the past year included the two 75,000-kw. sets in the Barking extension of the County of London Electric Supply Company; the 67,200-kw. sets for the Battersea Power Station of the London Power Company (one machine is being supplied by the British Thomson-Houston Company, and the other by the Metropolitan-Vickers Electrical Company); a 30,000-kw. turbo-alternator for the Ford Motor Company at Dagenham; a 50,000-kw. turbo-alternator for the West Midlands Joint Electricity Authority. The remaining transformers for the Uhl River Hydro-Electric Scheme have now been practically completed, the company having supplied 61 transformers having a total capacity of 114,375 k.v.a. A total of 1,116,000 k.v.a. of transformer capacity has now been ordered from the company by the Central Electricity Board. Numerous other large transformer contracts have been secured.

Management in Industry.

A manifesto on "The Management Factor in Industry" was issued on January 2 by 31 industrialists and public men. The manifesto is signed by, among others, Lord Amulree, Sir Herbert Austin, Sir Francis W. Goodenough, Mr. Frank Hodges, Sir D. Milne-Watson, Lord Eustace Percy, Mr. Arthur Pugh, Sir Josiah Stamp and Mr. Evan Williams. Nothing is more urgently needed to-day, the manifesto states, than a full appreciation of the national importance of the management function and of the rapid diffusion of management knowledge. Anxiety as to the quality of industrial management is accentuated by the growth of joint-stock enterprise, the wide diffusion of stock holdings and the consequent separation of the functions of ownership and management, which augment both the authority and the responsibility of management. Other nations, notably America, are training young men in management, and if we fail to take immediate steps to accelerate our management progress, we shall suffer not merely a loss of national prestige but a serious depletion of our national wealth.

MESSRS. SWAN, HUNTER & WIGHAM RICHARDSON, LIMITED, Wallsend-on-Tyne, have received an order for an all-welded oil-carrying barge, 180 ft. long, to carry 1,000 tons, for Canadian owners. This is a new departure in shipbuilding on the Tyne. A class for training shipyard workers in welding was started in Newcastle last year.

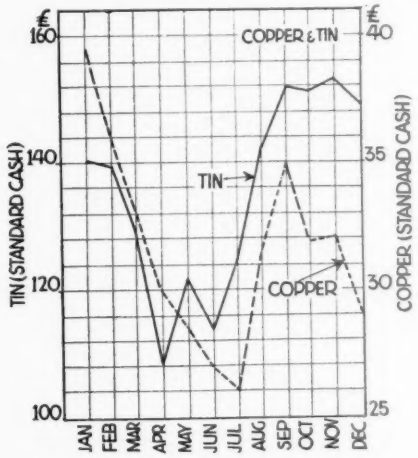
The Non-Ferrous Metals in 1932.

By Our Metal Exchange Correspondent.

In the non-ferrous metal markets there has been a year of widely fluctuating prices, new low records being set up by three out of the four members of the group, in spite of the production curtailment which has been a noteworthy feature of the situation. During the past year there were periods of considerable change in the external value of the £ and, in consequence, London equivalents have rarely stood still for long; but latterly sterling has shown signs of controlling gold prices, and this phenomenon may well develop during 1933. As regards restriction, we have seen considerable success attend the efforts of the zinc producers, but the scheme for copper, which has now broken down, has been on the whole a failure, while the tin position gives rise to much anxiety in view of the large holdings of the pools. Of any increase in consumption there is little or no sign, and it is very doubtful if many of the high-cost producers can withstand another year of production at the present ruinous prices.

Tariff Developments in 1932.

If 1932 is not remembered for anything else, it has certainly achieved fame as a year when



PRICES OF COPPER AND TIN IN 1932.

tariffs on metals were rampant, for, following a 10 per cent. *ad valorem* duty on lead and spelter imposed last March in this country, America put on a 4 cents per lb. tax on copper in June. At the Ottawa Conference a duty of 2d. per lb. on foreign copper entering this country was approved, but has not so far been put into force. Considerable opposition has arisen from users in this country in regard to the taxation of copper, and it is evident that consumers much resent taxation of raw material, even though a "safety" clause insisting on observance of the world price has been arranged. The date of imposition for the duty on copper is very uncertain, and forward transactions are hampered accordingly. In view of the Ottawa promises, some definite and authoritative statement is clearly necessary at this juncture.

DECLINE IN COPPER PRICES.

The year 1932 opened with copper quoted at 7¼ cents on the American domestic market, the exporters' price being 7.50 cents c.i.f. European ports, but this figure was, as usual, undercut by second-hands. (The £ then stood at around $3.40.)

Interest centred upon the new plans for output curtailment, in which, for the first time, Rhodesian interests were participating, and it was hoped that the cut to 26 per cent. of capacity would do more than balance production and consumption. In the light of after events, and in view of the fact that twelve months ago stocks of refined copper exceeded half-a-million tons, the phrasing of the producers' agreement on a "reversion to normal production when stocks have fallen below the total of four months' output or the price has stood at 12 cents for fifteen days," has an ironical interest. The parties to the agreement certainly did not suffer from lack of optimism, for, as things are to-day, they would gladly welcome a return even to the 7¼ cents level.

The first half of January saw a bull movement develop, as a result of which standard copper was pushed up to £42 15s. and wire bars to £50, the American domestic quotation being 7.50 cents. The movement, however, was not very long-lived and, with the copper cartel indulging in its old tactics of rushing up the price, second-hands appeared as cheap sellers and standard copper in London began to react. By the end of January it was fairly obvious that, not only had the hoped-for increase in consumption not occurred, but that actually less copper than ever was being used. Custom smelters shaded the price by 50 points to 7⅛ cents c.i.f., while there was again a rumour that the Exporters' Association might break up. The downward tendency in values continued, early February seeing the price at 6⅞ cents. c.i.f., while in the States, where demand was extremely poor, second-hands cut their quotations to 6 cents.

By the middle of the month the price in America was down to 5½ cents, while buyers here were able to cover at 6⅛ cents c.i.f., the standard quotation being as low as £35 5s., with wire bars listed at £40 5s. At this point there was a sharp upward turn on the strength of news from New York that credit facilities were to be extended and the announcement in London that foreign copper would be subjected to a 10 per cent. duty. Wire bars rose to £43 and standard to £38 15s. cash, but the improvement did not last long for, within a few days, it was officially announced that copper was to be placed on the Free List, and a serious collapse in standard ensued, the decline at one time depressing the price to £33 10s. At this time the producers were in session on the vexed question of curtailment, and some startling rumours reached this side, one of which envisaged a complete cessation of production for twelve months. Eventually it became known that agreement upon a further cut to 20 per cent. of capacity had been reached, this being in excess of the figure desired by many members of the conference. Prices rallied slightly, but realisation of the fundamentally unsound position of the metal checked the upward movement.

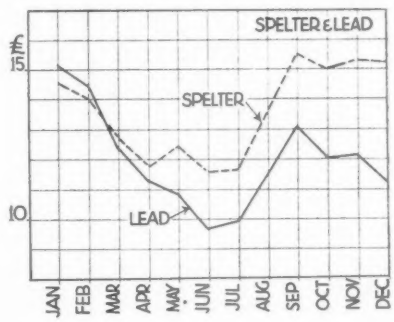
By early April standard was down to £30 and electro was quoted at £34 5s. to £34 15s., but price shading in the States and general pessimism brought standard back to £29 2s. 6d. before news of an earthquake in Chile stiffened values temporarily. For two or three weeks the standard market steadied at around £30, but early in May values began to sag again, on account of weakness in New York, where the demand was negligible. About this time the prospect of a 4-cents import duty in the States came to the fore, but London continued to register weakness, the standard market averaging about £26.

The United States Duty.

On June 4 news reached London that the 4-cent tax in the States had been adopted, and the market, taken somewhat by surprise, achieved an improvement, which culminated about a fortnight later at £28 2s. 6d. for standard copper, the trend thereafter being downwards until, on July 25, the bottom of the fall was reached, quotations being £24 12s. 6d. for standard and £28 for wire bars. Demand at this time was exceedingly poor, but it should also be noted that producers were not willing to part with a large tonnage at the ruling price —viz., 4.70 cents c.i.f. for electro. Following on strength in Wall Street, copper took a turn for the better at the end of July, and, with minor reactions, the rise continued through August culminating on September 8 at £38 for standard and £40 10s. for wire bars. Then followed a sudden slump, and the metal has never really held its head up since, although, close on the end of the year, some slight recovery took place, the quotation even so being little better than 5 cents. The main cause of the collapse in December was, of course, the break-up of the producers' conference on curtailment and the prospect of a price war in 1933.

Tin.

The year 1932 opened with the quotation for cash tin on the London Metal Exchange standing at about £141 5s., with a contango of £3 for the 3 months position. A sharp fall of about £4 followed almost immediately, the price continuing to fluctuate above and below £140 until early in March, when news that the pool would no longer publish its holding brought heavy selling and a sharp decline to below £130. On March 1 foreign tin was made subject to a 10 per cent. *ad valorem* import duty with free entry



PRICES OF LEAD (SOFT FOREIGN) AND SPELTER (ORDINARY) IN 1932.

for ore and concentrates, a concession vitally important to the smelting industry in this country.

The market was erratic throughout March, but early in April sentiment turned very weak on the publication of figures showing that the total visible supplies at March 31 were about 60,000 tons, or some 10,000 tons higher than twelve months previously, in spite of the drastic curtailment of output. The market slumped badly and by April 12 quotations were no better than £102 7s. 6d. for cash and £104 12s. 6d. for three months. Some buying, however, developed at this level and assisted a modest recovery in values. Before the end of the month sentiment improved on reports of additional curtailment, £117 5s. being recorded on April 25. After this came sensational news of an intended additional cut of 20,000 tons p.a. in the rate of production and a two months "holiday" in output. By May 6 cash tin was quoted at £129 10s. but the pace was too hot and some reaction followed, which brought the price back to £120 5s. by mid-May, and to £107 5s. by the end of the month. Early June saw the price below £110, but a recovery followed and, on better statistics, £127 10s. was reached on July 7.

The month of August saw the tin market caught up in the optimism arising from the Wall Street "boomlet," and on August 30 the L.M.E. listed tin prices at £149 17s. 6d. cash and £150 17s. 6d. three months. A further spurt, in sympathy with the strength in copper, brought these to £157 16s. 3d. and £159 6s. 3d. respectively on September 8, but a sharp reaction followed and subsequent events have shown early September to have been the peak period for the year. The market then entered upon a period of fluctuating prices, professional support being afforded by the second "pool," which had been formed to reinforce the efforts of the original group. About mid-November the quotation rose to £157 for cash, but reacted, and during the second half of December ruled mainly £1 to £2 below the £150 level.

Spelter.

The opening of last year found spelter shaping for a better statistical position, as production was down to 50 per cent. of capacity, and during the greater part of the first two months values fluctuated between £14 and £15, with trade buying on a modest scale. Late in February some weakness developed, and on the last day of the month spot fell to £13, while by March 16 it was £12 3s. 9d., in spite of the fact that on the 1st of that month a 10 per cent. *ad valorem* duty on imports of foreign zinc was imposed. Some improvement followed, but adverse sentiment and the poor industrial demand compelled a further slide in values to £10 11s. 3d. on April 6, at which level buying revived somewhat on the realisation that the metal was abnormally cheap. This proved to be the turning point, and the metal was supported from an influential quarter on 'Change, as a result of which £12 10s. was reached on April 27 and £13 by May 4.

Rumours had been current of additional curtailment, but in the absence of definite news values sagged, the price at May 31 being £11 8s. 9d. Minor fluctuations were seen during June and July, and then, as in the case of copper and tin, August brought a sharp rise to £15 1s. 3d. on the last day of the month, while a final spurt, sadly overdone, rushed the quotation up to £16 10s. on September 7. The reaction amounted to about 30s., but for some time past the market has kept on the right side of £15, and, now that production is down to 45 per cent. of capacity, this metal appears to be ripe to take advantage of any improvement in demand. The past year saw the achievement by the Zinc Cartel of an ambition to reduce stocks to manageable proportions, and spelter certainly looked healthier at the end of 1932 than it did at the beginning. Another noteworthy feature was the definite re-establishment of the premium over lead, which at the year-end amounted to about £4.

Lead.

At the beginning of 1932 lead was quoted at £15 7s. 6d. spot and forward, and has, therefore, lost something like £4 on balance during the twelve months—not a very good showing compared with spelter, which finished about £1 above its starting level. The reason for the decline in lead values is to be found in the marked deterioration in demand from the cable industry, particularly during the second half of the year, and the fact that the general slump in trade has very adversely affected the building industries. Supplies are very ample and stocks in this country have shown a tendency to increase during the year, while production seems to have been well maintained throughout the period under review.

A fluctuating market was seen through January and February, the tendency being downwards, and before the end of the latter month the price was below £14, while early in March, largely in sympathy with spelter, a further decline occurred, the quotation on March 1 being £12 8s. 9d. spot and £13 forward. The imposition of the 10 per cent. duty steadied the market for a day or two, but, in the absence of demand, the tone weakened and on March 29 values had further reacted to £11 11s. 3d. to £11 7s. 6d. Early in April came the abandonment of the lead pool and a momentary collapse to £9 17s. 6d. to £10 2s. 6d. on April 1, but this was the bottom, and some recovery followed on hopes that freedom of trading might bring about a better state of affairs. Events did not justify this expectation and throughout May and June values declined, the lowest point for the year being reached on June 16 at £9 5s. Some recovery followed; lead joined in the August "boom" and touched £14 7s. 6d. cash and £14 12s. 6d. three months, on September 7, From that point, however, a sharp setback occurred and the tone of the market has since been easy.

Steel Deoxidation.

Of the many properties peculiar to aluminium, few are more interesting than the high affinity of the metal for oxygen, an affinity which, in the ordinary way, simply results in the metal covering itself with a closely-adherent corrosion-resisting film. This very property, however, makes the metal of extraordinary value to the steel manufacturer, and aluminium, either as pure metal or in a ferrous alloy, will be found amongst the "additions" in practically every steelworks or foundry.

The value of aluminium lies in the rapidity with which it will reduce the oxides contained in the steel, ensuring soundness of the ingot and giving a denser structure than is produced by other deoxidisers. It can be used alone or in conjunction with other deoxidisers such as silicon and manganese, and, acting as a deoxidiser, it reduces oxides such as FeO, Co and MnO, forming Al_2O_3. There is also some evidence that the metal acts as a degasifier, removing hydrogen and nitrogen to form hydrides and nitrides. The Al_2O_3, FeO inclusions obtained when deoxidising with aluminium are liquid below the melting point of steel, and thus show some fluxing properties. The major part of such inclusions will be contained in the segregated part of billets, but it has been found that a certain proportion of the Al_2O_3 remains in the billet. These Al_2O_3 particles have no effect on the properties of the steel unless a large excess of aluminium is added, when the alumina inclusions will form groups which may elongate during forging. It is, therefore, important to add only sufficient aluminium to give complete deoxidation

The aluminium may be added either in the ladle or during solidification, the amount of the addition depending largely on the type of steel produced. For example, Herty and Fitterer, in "The Physical Chemistry of Steel Making," suggest an average addition of 0.05 per cent. with a maximum of 0.15 per cent., whereas A. M'Cance, in "The Balanced Reactions of Steel Making," shows that at a temperature of 1,700 deg. C. 0.0062 per cent. of aluminium will give 95 per cent. deoxidation. It would appear, therefore, that where the aluminium is added in the ladle, it is advisable for the manufacturer to vary the additions to suit his own particular grade of steel. Where the metal is added to the ingot mould during solidification it is usual to add the granules by hand until it is decided that sufficient quieting of the steel has been produced. Concerning the relative efficiency of the two methods of addition, Boylston, in "The Iron and Steel Inst. Carnegie Memoirs of 1916," showed that the efficiencies of various deoxidisers were in the following order: (1) Aluminium added to ladle, (2) silicon, (3) aluminium added to mould, (4) carbon-free ferro-titanium, (5) ferro-manganese.

In addition to its efficiency, aluminium has also been shown to be extremely economical, since, in a given steel, 1 unit of aluminium will give the same degree of deoxidation as 9 units of manganese. Regarding the form in which the aluminium is employed, it is preferable to use pure metal, but, if desired, an aluminium-iron alloy will give satisfactory results. Under no circumstances should aluminium alloy scrap be used for deoxidation, since such alloys may contain other alloyed elements which would have a deleterious effect on the steel. Finally, it is of interest to note that where tungsten is being added to steel, the mixing of the former with a little finely-divided aluminium will prevent oxidation of the tungsten and assist its solution in the steel.

For the purpose of any of these additions, aluminium can be supplied granulated or in the form of "buttons." Alternatively, the metal may be employed in the form of squares of sheet metal about 1½ in. by 1½ in. These are supplied by the British Aluminium Company, Limited, in two thicknesses, one in which the squares run 128 to the lb. (⅛ oz. each) and in the other 64 to the lb. The use of these squares saves all trouble of weighing, and the user can add any predetermined percentage of aluminium to his iron or steel with a minimum of delay and inconvenience. Some users, however, prefer to employ aluminium in the form of cast rods, which are supplied by the British Aluminium Company, Limited, roughly in a half-round section ⅜ in. by ½ in. and 24 in. long. These rods weigh about 13 or 14 ozs. each.

New Bearing for Mill Equipment.

SYNTHETIC RESIN WITH TEXTILE BASE.

A Chicago firm is making from a new type of bearing a synthetic resin similar to bakelite and with textile material as the base. The strong belting textile material of the base reinforces the resinoid, which completely fills and saturates the former. The composite material is then subjected to great heat and pressure. At approximately 1-ton per sq. in. pressure and 340 deg. Fah. the product sets. Physical characteristics are entirely changed and the bearing is no longer fusible or soluble. According to the manufacturer it cannot be resoftened by heat, will not absorb water by heat, will not absorb water or oil, and is resistant to most acids; it is, however, attacked by hot caustic alkalis. The finished bearing is hard and will show a Brinell hardness of 30 to 40 and scleroscope reading of 70 to 80. The bearings are claimed to be particularly satisfactory in cases where it is easier to apply water as a lubricant than oil, though they will operate satisfactorily with oil if this is desirable.

Bearings of this type have been on test in practically all of the major steel mills as roll-neck and roll-table bearings in rod, strip, bar, structural, plate and blooming mills. The fact that it is difficult to keep mill bearings oiled and the fact that plenty of water is always available, is said to make this new type of bearing particularly suitable for a large number of steel-mill applications. Bearings from the smallest size up to 32-in. outside diameter are successfully formed.—"Steel."

Production of Stoves in Canada.—The Dominion Bureau of Statistics at Ottawa reports that fifty-six Canadian factories turned out in 1931 cooking stoves and ranges of all kinds, heating stoves, electric rangettes, electric-cooking plates and grills, and gas-cooking plates, valued in all at $6,979,497. The output included 57,129 coal and wood cooking stoves and ranges, 31,530 gas-cooking stoves and ranges, 26,441 electric-cooking stoves and ranges, 44,224 coal and wood heating stoves, 3,418 combinations for gas and coal, 1,583 combinations for coal and electric, and 125 combinations for gas and electric. In addition, there were 62,168 electric-cooking plates and grills, 4,049 electric rangettes and 7,127 gas-cooking plates.

XUM

Foundry Equipment Industry in 1932.

By D. Howard Wood (President, Foundry Equipment and Supplies' Association).

A review of practically any industry in this country during the past year can hardly be expected to provide cheerful reading. The majority of people at the end of 1931 gladly welcomed the advent of the New Year, but their optimistic expectations as to business prospects cannot be said to have been realised, and consequently the new year of 1933 will probably be welcomed with even greater confidence. If the signs of the moment can be taken as a definite indication of the business prospects during 1933, then such a welcome can be given with a reasonable degree of justification.

In such circumstances it can hardly be expected that makers of equipment for any industry, particularly that of the foundry, can report unusual activity. It is unnecessary to attempt to enlighten foundrymen on the question of competition, as on all hands one hears the same complaint on this score. However, in spite of all the forebodings which have been in abundant evidence, it is cheering to report that there have been considerable foundry extensions during the period under review, whilst one or two new foundries have been put into operation. Foremost amongst these developments is the opening of a large foundry in the South of England devoted to automobile castings, which is probably the largest installation not only in this country, but in Europe. It is to the undoubted credit of the British manufacturers that this installation was 95 per cent. British in design and manufacture. The plant referred to, which is on mechanised lines for mass production of repetition castings, consists of melting equipment, sand preparation and distribution, mould handling, vertical-core stoves, conveying machinery for the manufacture and handling of cores and equipment for fettling and dressing castings. The whole scheme is novel so far as this country is concerned; one special feature is the introduction of machines of the sand-slinger type for the purpose of core making. One of these machines is continuously employed in the making of motor-cylinder cores. Other machines of similar type are used for the moulding of cylinder blocks. The three machines alone are capable of handling 90 tons of sand per hour. This foundry has a present capacity of 150 tons of finished castings per day of 8 hrs.

A new mechanised foundry for the production of light electrical castings has been equipped and put into operation in the North Midlands, whilst in the East Midlands a new coremaking plant, comprising conveyors and electrical core-drying stoves, has been installed. Considerable extensions have been made to a foundry in Lancashire and the whole of the equipment modernised.

In the Midlands three foundries have been entirely mechanised, one for the production of automobile castings, a second for mass production of light electrical castings (where exceptionally high output is obtained), and a third for light castings of various sizes. During the year there have been considerable developments in the rotary type of melting furnace, and a number of these plants have been installed in foundries in various parts of the country for the production of malleable and grey iron. Further progress has also been made with a new type of cupola, and upwards of 20 cupolas of the balanced-blast type are now in operation. In some cases the plants are new, whilst others have been converted to this principle

Moulding and Core Making.

Reference has already been made to the application of a special type of moulding machine for the making of cores. Possibly the greatest development in the industry during the year relates to sand-handling and coremaking. Several new pneumatic machines for coremaking have been introduced, and a large number installed. The necessity for reducing the weight of castings, combined with the increased strength which can now be obtained from cast iron, has resulted in the increased demand for cores. This in turn has led to the development of coremaking machines, etc., to meet the needs of the industry. Further developments on these lines are being made at the present time.

Less than five years ago the number of foundries in this country employed making sand-preparation and distribution plant could be counted on the fingers of one hand, but in that short space of time the development of mechanised foundries has greatly increased. There

Mr. D. H. Wood.

(President, Foundry Equipment and Supplies' Association.)

are now probably at least one hundred complete plants for mechanical treatment and conveying of sand in use, and the number is being added to almost weekly. The drying of sand is becoming of greater importance, as in these day, when pig-iron, coke, etc., is bought to analysis, sand is probably the only material used in the foundry which is an unknown factor. The number of types of moulding machines has been considerably extended, there now being British-made hydraulic-pneumatic and electro-magnetic machines available.

It is impossible to mention separately all the new plant which has been made available for foundries during the year, but that these are not confined to large items of plant and equipment will be gathered when it is mentioned that such an article as an air-operated core-box vice has been introduced, and the all-important question of the welfare of the individual moulder continues to receive attention, as witness a new type of moulder's boot which has been patented.

Tariffs.

The import of foreign foundry plant has undoubtedly been restricted as a consequence of the imposition of tariffs and the variations in rate of exchange, but in some cases arrangements have been made in this country for the manufacture of plant previously imported, whilst it is understood that negotiations for the manufacture of other foreign plant are in progress. In a similar review a year ago it was remarked that foundries who had maintained, and in several cases increased, their output during the year were noticeably those fully equipped with modern plant. This statement has been confirmed during 1932. If a study of such information as is available is made, ample evidence of this will be forthcoming. This seems to emphasise a statement made recently by a prominent foundryman: "Those foundries who have not already done so will have to equip and reorganise themselves in such a way that they can make a profit whilst producing castings at competitive prices. If they cannot, or will not, do this, then they will undoubtedly go out of business." Iron and steel foundries generally would admit that present prices are at bedrock; that is, considerably lower than they should be, and it is hoped than they ever will be again. Certainly the makers of foundry equipment and supplies will agree that the current prices cannot be maintained much longer, and that there is bound to be an increase in the near future. This indicates that now is the most opportune time to install new plant, not only on account of the present low cost, but also because at this juncture it is imperative that foundries should be equipped to deal with the increased trade which will inevitably come, and which, indeed, is already beginning to be experienced in many directions.

It may not be entirely out of place to here mention the question of the cost of preparation of schemes and layouts for new foundries. In one or two cases where figures have become known the cost of preparing drawings, details for estimating purposes and the actual estimates by four or five competitive firms has reached as much as £2,000 in connection with a single job. The cost of the complete job would probably not be more than three times this amount. Obviously this is to the disadvantage of the buyer as well as the supplier, as such costs have to be covered. It might be worth while suggesting that in cases where a consultant is not employed and the foundry executives have no real definite data upon which tenders can be invited, a procedure such as the following might be adopted. A reliable firm of equipment makers of repute may be invited to collaborate with the executives in the preparation of a scheme. This would enable a detailed idea of the plant required to be prepared upon which further tenders could be invited. Assuming that the tenders when received were generally satisfactory and prices more or less equal, then the original firm would be given preference in view of the preliminary work done by them. This would minimise the cost of estimates, to the definite advantage of purchasers and suppliers.

Although, or possibly because, the output of the firms engaged in this particular section of industry has fallen below normal, it does not follow that their activities have been lessened. New plant has been developed, as will undoubtedly be seen by the exhibits at the forthcoming Foundry Trade and Equipment Exhibition to be held in the Agricultural Hall from April 23 to May 24 this year. It is hoped that in the interests of the industry in general, foundry employers will allow ample opportunities for their managers, foremen, and if possible all their employees to visit this exhibition. As such an opportunity only presents itself once in three or four years, a visit is well worth while. It has already been mentioned that there is definite evidence of increased activity in the foundry industry, and it only remains to express the confident hope that this activity may be more widespread during the current year.

The Situation of German Iron Foundries in 1932.

By Dr. Th. Geilenkirchen.

So often in past years have I had the opportunity at the close of the year of reporting in this place on the situation of the German iron foundries that I could compress my opinion in the sense that 1932 was more unfavourable for the iron foundries than its predecessor, but that it is hoped that the general economic conditions in the New Year would become better. Hitherto such hopes have always proved to be delusive, and 1932 in particular surpassed all predictions concerning a still more unfavourable development of economy in conditions. Nevertheless, economists venture to express the hope at the beginning of 1933 that the rock bottom level has now really been reached and that henceforth it will again move upwards. This time the hope seems also actually to be justified. In this direction all indications point not only in the world economics but also in the German iron industry. The number of failures of old and highly-respected firms did not diminish in the past year, but in recent months much greater confidence and stability have taken place. Of course, this may in part be ascribed to the circumstance that at meetings of creditors of insolvent firms the idea has adopted that the hope of recovering outstanding money is less with the complete collapse of an undertaking than if its activities are maintained by mutual agreement. In any case, however, the fact that the number of failures has decreased, besides other favourable occurrences, will be considered as a sign of trade improvement.

Employment Statistics.

The decrease in employment in the German iron foundries also seems to have come to a standstill. A good measure for comparison of this is the number of workmen employed. On April 1, 1928, the foundries included in the Association of German Iron Foundries still employed 83,000 foundry workers; on April 1, 1929, the number was 70,000; 64,000 on April 1, 1930; 45,000 on April 1, 1931, and only 25,000 on April 1, 1932. Since then, however, the number of workmen employed has remained on the same level and even slightly increased towards the end of the year.

The reasons for the unfavourable development of industry in 1932 are obvious; they are due in the first place to the general scarcity of capital and money. The immense burden of reparations, which in the course of this year will probably be definitely abolished through the Lausanne agreement, in the post-war years has withdrawn the life blood from the German industry—already extraordinarily weakened through the war—that with insignificant exceptions the working capital in all undertakings has disappeared and it has been necessary to have recourse to the material assets. Moreover, the intolerable taxation and wages policy of the post-war years—alleged to be due to social welfare considerations—has taken away any surplus which, despite the poor trading conditions, has been realised in individual works, so that it was nowhere possible to form the equivalent for the lost working capital. For years past German agriculture has been in a state of confusion, and, despite all the State aid, it has not been possible to relieve it from debt. The prices for agricultural products have fallen considerably below the pre-war prices, and agriculturists from the large landowners to the smallest farmer have the greatest difficulties in even producing the essential products for their subsistence. It is therefore impossible to carry out the necessary equipment of the agricultural industries with machines of all kinds which are necessary for intensifying production, and thus the works manufacturing agricultural machinery scarcely find any sales in the home market.

Out of Service Machinery.

But the same also applies to the entire engineering industry in Germany. As compared with the years 1927-29, the degree of employment of all industrial establishments has diminished in such a manner that on all hands a large part of the working machinery is idle, and the degree of activity must be considerably increased in order to utilise the existing machines, so that scarcely one works, no matter what it produces, has any need to-day of new machines. Moreover, in recent years, many establishments which have been brought to a standstill, good and still very efficient machines have gone out of service and could be acquired at ridiculously low prices by other works still producing, so that through this fact any possible demand, especially for machine tools, has been covered without recourse being made to the machine-tool builders. In all these branches the sales of the iron foundries as the main suppliers of the engineering works have been severely affected.

The conditions have been similar also in the branch of structural and builders' castings. Building activity in 1932 declined to a minimum. In all towns and in the country thousands of dwellings stand empty, so that not the slightest need for new buildings is apparent. Building operations carried out by the public authorities in the post-war years were excessive, so that to-day there is neither demand nor the necessary capital for new construction. As a consequence the sale of real builders' castings, as for instance fall pipes, sanitary castings, radiators, etc., has decreased to a negligible quantity. Actually a demand still exists for sewerage and water-supply installations, but, owing to the general confused situation of the finances, the local authorities, who are now in the first place charged with the maintenance of an army of a million unemployed, are no longer able to place any orders of this kind. Hardware castings for daily use are also in comparatively slight request as every household is endeavouring to manage with the existing appliances and to economise in expenditure for new ones.

All these conditions have combined in having the effect of bringing down to a minimum level the inland sales of the German iron foundries and engineering works, and as a consequence they have become more than ever dependent upon the export trade. But also in this case the difficulties have increased year by year. The tariff walls with which all countries have surrounded themselves are having an increasingly prohibitive effect. Through the depreciation of sterling and the corresponding movement of the currency of other countries, which have also left the gold standard owing to the action of England, the competitive ability of the German works in the world markets has been generally prejudiced. In connection with this event it has been suggested in many quarters that the German currency should be depreciated. However, German economists and the great mass of the population are agreed that such an action would be fatal for Germany. A second inflation would be unable to be borne by the German nation on account of the consequential destruction of the wealth and larger or smaller savings credit, built up at great pains since the period of inflation; and the German Reich Bank is therefore devoting all its means to the maintenance of the German currency. The strict foreign exchange measures connected with this action place extraordinary difficulties in the way of German business, but they will be willingly borne by all circles of the population having regard to the object aimed at and so far achieved.

The exports of German manufacturers—and to these belong in the first place the products of German structural and builders' castings—are also rendered further difficult through the measures demanded by agricultural interests for the fixing of quotas for agricultural products, to which measures the German Government was forced to give way in many respects. The much depreciated prices of agricultural products, having regard to the lack of purchasing capacity of the population, were still further depressed by the great competition of non-German agrarian countries, and German agriculture demands with increasing emphasis the restriction of foreign imports in order to preserve its continuation. But through these efforts just those countries, which are still counted as the best customers of German manufactures, have been strongly prejudiced in their export interests, and even the mere announcement of the proposed quota measures has been sufficient to start a movement against the import of German industrial products, which has not yet abated.

Russian Orders.

The only country which has supplied the German engineering industry and consequently the iron foundries with large orders has been Russia, which in the execution of her Five Years' Plan, ordered on a large scale steel and rolling-mill equipment as well as various machines, particularly machine tools. Actually the conditions under which these orders have been placed are extraordinarily unfavourable. Only a few firms which construct highly-specialised machines have been able to get prices which would yield a profit. But the prices for the majority of the products move on a line which comes very closely to the level of the costs of production. Moreover, long-term credits have had to be granted for payment, and as most of the suppliers lacked the necessary capital, the entire German financial structure with the support of the Government has had to build up a very complicated system. Finally the Russian deliveries have been burdened with exceptional difficulties and in part with ridiculous requirements as to quality, and these were only reduced to a tolerable measure after direct negotiations had taken place between the Association of German Machine Tool Manufacturers and the Association of German Iron Foundries on the one hand and the Russian trading delegation on the other. Nevertheless, many machinery works and iron foundries have experienced great difficulties through the rigid adherence of individual Russian inspectors to their regulations, and many castings were rejected which would have wholly satisfied the requirements of German ideals that are recognised to be quite high. Despite all these difficulties the German machine-construction industry accepted these orders because the refusal of them would have had the consequence of causing the stoppage of many works and therefore of their suppliers of castings.

A Price-Cutting Orgy.

It is not surprising, under the influence of the circumstances described, that the prices of castings in general sank to a level which in most cases scarcely cover the costs of production and frequently imply a loss for the interested works. The Association of German Foundries has certainly worked for decades past in the direction of bringing the prices of castings to such a level as would at least ensure the foundries a small profit and thus ensure their possibility of existence. These efforts led in the autumn of 1931 to the setting up of a graduated minimum-price list for three economic districts in Germany, which seemed at first to be carried into effect very well. But the whole economic and political development has brought it about that these minimum-price lists are increasingly being

left out of consideration, so that the fall in prices finally assumed such a measure as surpassed everything previously known. The first blow received by the price system was through the emergency ordinance of December 8, 1931, which called a reduction of 10 per cent. in all the prices controlled by cartels. Although castings, the prices of which are fixed by open negotiation between producers and customers, were not affected by this ordinance, the foundries under the general pressure of their customers that was setting in were compelled to grant price concessions which far exceeded the reduction in the costs of production that was rendered possible through the emergency ordinance. The ordinance in question, which, by way of cheapening goods with a simultaneous reduction in manufacturing wages, aimed at an increase in the purchasing power of the mark, but it has not had the effect of a revival in trade which had been envisaged; and in this, as in many other cases, it is shown that industry improvement cannot be switched into gear by an enforced reduction in prices. The strongly-favoured tendency for reducing all prices which was caused by the emergency measure induced purchasers all along the line to hold back in the allocation of orders, because they believed that they would later on be able to buy still cheaper; and this systematic attitude of all consumers finally led to all prices falling day by day. This has also had its effect on the market for castings. Every consumer of castings who was supplied by one foundry at such depressed prices found out, on asking for offers, that other foundries were willing to produce the article at a still cheaper price than the original supplier, and the latter in most cases, in order to retain his customer, has accepted the order at the further depressed prices of a competitor. Through this playing off of individual makers against each other—in connection with which sporting methods were not always employed—the prices of castings have been increasingly depressed. Under such a situation all the warnings of the Association of Iron Foundries to adhere, in quoting prices, to the approved principles of the Harzburger costing system for the calculation of the costs of production, have been in vain. The fight finally turned on the question of to be or not to be. Every foundry let itself be guided only by the single idea of maintaining activity under any circumstances, even if it still involved great sacrifices. A foundry once brought to a standstill is not so easily brought into operation again and it then implies only a worthless heap of stone and iron, and consequently many undertakings have resolved on the lesser evil of holding out at least so long until better times arrive, by making substantial daily sacrifices. Many foundries in this economic fight, and despite all efforts, have collapsed and many others will follow unless the desired improvement, of which in general confidence exists in German trade circles, and also in those of the German iron foundries, actually makes its appearance.

In order to understand this conception of the revival in trade that is actually to be expected, and to which expression was given at the general meeting of the Association of German foundries held at Goslar in September, 1932, and which, despite all reactions, has hitherto still endured, it is necessary more closely to investigate the development of the political conditions in Germany during the year 1932.

Politics and Business.

For 13 years the German economic policy has been conducted according to trade-union point of view. Legislation has been directed in the first place towards ensuring the working population a definite minimum income without regard to whether industry, which still finally must provide the means for the satisfaction of the vital needs of the whole nation, would be able to earn the additional burdens arising therefrom. As a consequence of this policy, the costs of production have increased still more without the equivalent being offered in the form of larger receipts. The leaders of industry have for years past demanded that this ruinous policy should be changed, but their warnings have been unheeded. Also the Bruning Government, which was non-Socialistic, did not undertake anything serious despite its better perception in order to remove this systematic undermining of the economic structure of Germany. The trade-union circles have settled themselves more firmly in the conduct of the Reich, and above all in the great country of Prussia, and in part have, through political subterfuges, even anchored their power, although they have no national majority behind them. The reaction against these untenable conditions has led in recent years to the exceptionally strong growth of the National Socialistic party, under the pressure of which the trade-union-influenced Bruning Government was finally substituted by a neutral Government, but directed to the Right. The new Government immediately devoted all its energies to the removal of all the inconveniences described. The economic programme announced by Chancellor von Papen at the end of August in Munster proceeded in the first place in the direction of liberating industry from all fetters, in which the trade-union Governments had placed them, and its further development was again to place business in the hands of the now free and responsible employers. The most pressing problem to be solved was the diminution of unemployment, instead as hitherto by restricting the support of the workless, by way of solving in a natural manner, since the employers were materially facilitated in the possibility of engaging new workpeople through the loosening of the rigid wage tariffs, through premiums on the addition of new workpeople and through taxation relief. The system of credit-note certificates prescribed within this framework imply on the one hand a definite promise of subsequent relief in taxes, and on the other a certain widening of credit, which, however, is kept within narrow limits and forms no danger of an inflationist development. This new industrial programme, which seems specially adapted to remove the hindrances to enterprise which has been growing in recent years, was welcomed in general by German industry as a fact, and soon a revival made itself perceptible in many trade branches. This applies in particular to the branch of domestic castings. Thus, for instance, in the production of iron stoves, which experiences a seasonal revival as a rule in the spring and summer, having regard to the expected winter's sale—but which completely failed to make its appearance in 1932, as the builders' merchants in general bought no further stocks—a late revival in business took place in the autumn. As a consequence, all the works which carry out with this production were again able to undertake the employment of a larger number of workmen.

Useful Legislation.

The building market was also rendered somewhat more active through the Papen reforms. According to the programme, an amount of 50,000,000 marks was freed for the execution of the most necessary house repairs, on condition that grants of 20 per cent. should be made out of it towards the repairs. This amount of 50 million marks was absorbed within a very short time and in this way a total of 250 million marks was conveyed to the building market, in which the light-castings foundries were largely interested. As a consequence the amount originally proposed for the further revival of economy was doubled. A lasting effect of these measures will naturally only take place when the house-interest tax introduced after the war, which deprives house owners of the means for the maintenance of their houses, is abolished, as is unanimously demanded by the representatives of industry.

Unfortunately the further political development has again brought about a re-action. In a remarkable manner the reinforced national socialistic movement associated itself with the comprehensible opposition of the trade unions in every way against the Government of von Papen. The reforms of the Government lay wholly in the sense of a large number of those electors who had joined this movement, and after the unexpected dissolution of the Reichstag, a large number of these electors separated from Hitler at the new election. However, the strengthening of those parties which had placed themselves behind Papen was not large enough to provide him with a majority, and unfortunately through this the Government of von Papen was induced to resign. With this moment stagnation actually began in many industrial branches, including the foundries.

Herr von Papen had believed that, in having to give place to Herr von Schleicher, the personality of the latter, despite his adhesion to the Papen programme, offered fewer points of attack by the opposition parties, but the sacrifice was made in vain. Although Herr von Schleicher made some less important but yet risky concessions on the whole situation of the matter to the trade unions, the same opposition which turned against Herr von Papen, to-day has also turned keenly against him. No doubt on a further election the parties which stand behind the Government will strengthen and the opposition be weakened. But with this German industry would not be served. It requires in the first place to be able to develop further in an undisturbed manner, and it is therefore to be honed that the Government may succeed to agree with the Reichstag in some way which will enable it definitely to carry out the Papen programme.

The International Aluminium Competition.

It will be recalled that the world producers of aluminium decided to renew in 1932 the International Competition, open to technical workers in every part of the world, originated with the object of awarding prizes for the best suggestions made relative to the use of aluminium and its alloys. The competition jury, who met in December of last year, allocated the 20,000 (Swiss) francs voted for the prize-money as follows:—4,000 to Dr. Eckert, of Grevenbroich (Germany), for his researches on the protection of aluminium and its alloys by the M.B.V. process and the improvements made in this process. 4,000 to Mr. Philippe, of Paris (France), for his memorandum on the use of aluminium alloys in gas- or oil-fired central-heating plant. 3,000 to Mr. Y. Hirakawa, of Yawata (Japan), for his article on aluminium tuyeres for blast furnaces. 3,000 to Mr. Th. Schweizer, of Zurich (Switzerland), for his memorandum on the use of aluminium for grain silos. 2,000 to Mr. Py, of Paris (France), for an improved model of an aluminium-alloy bicycle. 2,000 to Mr. Steinborn, of Rodange (Grand Duchy of Luxemburg), for his study of the possibilities of the use of aluminium and its alloys in blast furnaces and steelworks. 2,000 to Mr. H. Tatu, of Lyons (France), for his memorandum on the use of aluminium in dyeing and cleaning.

The International Aluminium Competition for 1932 met with a better response than that of 1931 in the technical circles of most countries. More than 1,000 persons addressed inquiries to the Bureau International de l'Aluminium as to the details of the competition and 405 memoranda were received, which in the great majority of cases were based on serious investigations and showed an expert knowledge of the light metals.

XUM

German Foundry Research.

By J. G. Pearce, M.Sc., M.I.E.E.

In THE FOUNDRY TRADE JOURNAL for June 2, 1932, the writer gave a brief note of the opening of the enlarged melting shop and foundry of the Aachen Technical High School, and, later, in the issue of August 11, 1932, described its equipment. It is proposed to complete these notes by giving a brief account of the equipment and work of the remaining part of the Foundry Institute.

The Technical High School at Aachen furnishes instruction in pure and applied science to a standard equal to that of our universities, and, indeed, it is a university for the teaching of science. It has four faculties—General Science, Building Science, Engineering Science and Science of Materials. The last mentioned is divided into three departments, mining, chemistry and metallurgy. The Department of Metallurgy, which is the largest of its kind in Germany, is made up of four independent institutes, one for non-ferrous metals, one for silicate chemistry, the third for iron and steel and the fourth is the Foundry Institute. The Aachen Technical High School is the oldest technical university in Germany, although the mining schools of Clausthal and Freiberg are older. The growth of Aachen as a metallurgical school is due to its favourable situation in the neighbourhood of the great coal, iron and steel industries of the Rhine and Westphalia. The number of students receiving instruction in the great metallurgical schools at Aachen, Breslau, Berlin (Charlottenberg), Clausthal and Freiberg for the winter term 1931-32 is 467; of these Aachen has 190, while Clausthal and Freiberg have 81 and 84 respectively. These figures suffice to show the importance of the Aachen school, the total for which approaches that of the other schools combined. All these five schools train students to the stage of taking the engineering diploma, a State-recognised professional diploma. The course is a minimum of four years, followed by a year's practical experience, during which the student may complete the piece of work which will qualify him for the diploma. Students who take the doctor's degree require to have completed the diploma and then to have spent a further one or two years in undertaking a piece of research work and publishing the results.

While instruction in foundry science and practice is given at all the five schools, only at Aachen is there an entirely separate department for foundry metallurgy and engineering, and it is interesting to note that the State of Prussia, in which Aachen is situated, intends that Aachen shall continue to develop as a specialised foundry school. In this connection it should be noted that all the above schools are in Prussia, except Freiberg, which is in Saxony, although the Clausthal school actually comes under another Ministerial department, the equivalent of our Board of Trade, instead of the equivalent of our Board of Education. Aachen has an excellent foundry tradition in the work of Wüst, just as Clausthal has in that of Osann and Freiberg in that of Ledebur.

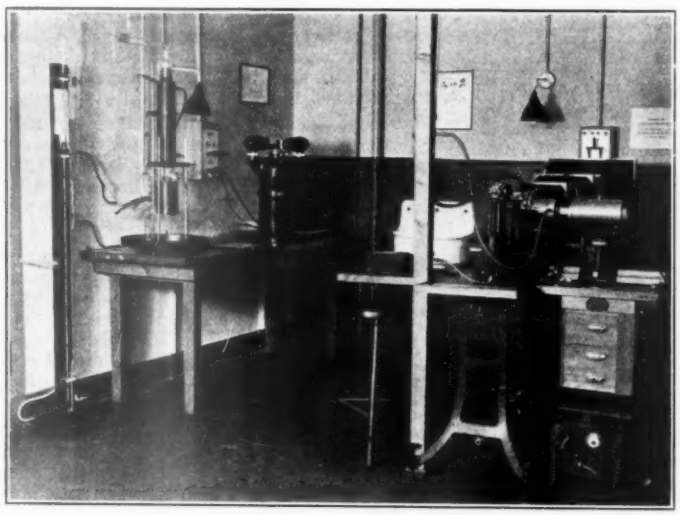


FIG. 1.—LEITZ DILATOMETER—AACHEN TECHNICAL COLLEGE.

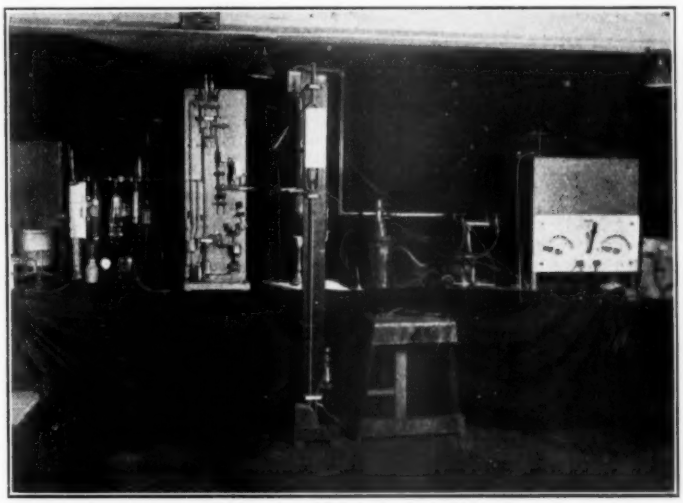


FIG. 2.—APPARATUS FOR THE DETERMINATION OF OXYGEN.

FIG. 3.—SMALL INDUCTION AND OTHER FURNACES.

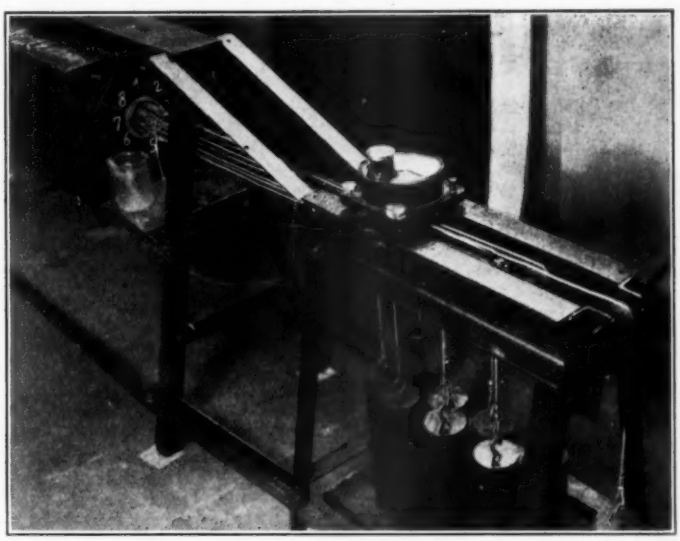


FIG. 4.—APPARATUS FOR THE ASCERTAINING OF GROWTH UNDER TENSILE LOAD.

It is not surprising that from the Aachen foundry institute there should come a stream of Papers embodying the results of foundry research. The investigations are carried out by students and by members of the staff. Minor investigations are carried out as exercises for the diploma and major investigations for the doctor's degree. Students, as a general rule, subsequently proceed to industrial posts. It might be thought that a certain measure of discontinuity would arise in the constant change of the personnel carrying out these investigations, but this is overcome to some extent because all projected investigations are discussed with the professor and other members of the staff, so that there is a certain continuity of research policy.

Buildings and Equipment at Aachen.

It is intended ultimately to house the foundry institute in an entirely separate building, for which ground has been obtained. At present it occupies about a dozen laboratories, with lecture rooms, etc., about 33,000 sq. ft., in the main metallurgical building, known as the Neumann Institute. Two rooms are equipped with photomicrographic apparatus. A new model Leitz apparatus takes photographs up to 3,000 magnifications, and the illumination on the specimen can be reversed for the convenience of studying inclusions such as sulphides, oxides and slags, which can be thrown into relief. There are also Reichert, Seibert and Zeiss makes for the use of students and for research work. Some of these have special features, such as the projection of the micrograph on to a screen, horizontally or vertically, or the possibility of examining an actual casting without taking a specimen from it. One of these rooms contains an admirable illustration of German instrument manufacture in the form of a Leitz dilatometer, shown in Fig. 1, at the right. Although the original model was built on the Chevenard principle the new instrument represents a very marked advance, and the actual dimensional change of the specimen under observation can be magnified 800 times, and the record photographed direct on to paper. The test can be done in vacuum or in various atmospheres. In another room a dilatometer made in the Institute has been constructed to give direct readings on a delicate gauge in thousandths of a millimetre.

Apparatus is, of course, available for taking thermal curves of various types of metals and alloys, and it should be noted incidentally that the Institute covers non-ferrous as well as ferrous metals. Work has been done on the influence of the shape of ingot moulds on inclusions and on piping. Another room has work proceeding on tensile strengths at elevated temperatures, both in air and under vacuum. Special machines have also been installed for the study of creep phenomena. Work has also been done on the study of scaling and growth, and in particular on the influence of silicon and nickel.

The late Prof. Oberhoffer began the investigation at Aachen on the influence of oxygen in ferrous metals, and apparatus (Fig. 2) has been developed for the measurement of oxygen both in iron and steel. In the sand laboratory a variety of apparatus has been used experimentally for determining the properties of sands, both mechanical and chemical. A high-frequency furnace is available for melting and superheating charges up to a weight of 1 lb., taking 3.5 kw. It is seen in Fig. 3.

The chemical laboratory and balance room is provided for conducting all analyses in connection with the various investigations, and a number of Tammann furnaces are available for melting up to 10 lbs. capacity.

The Melting Shop.

In the melting shop the oil-fired cupola, previously referred to, is being redesigned. Heat is supplied by oil burners in what looks like an enlarged wind belt. The flame should be reducing, and the burner air is preheated 300 to 400 deg. C. by the heat in the stack gases. Space is available for a rotary pulverised-fuel furnace. An Ellipsoid furnace carrying a charge of 8 cwt. is used for melting non-ferrous metals. A gas-fired annealing oven is capable of reaching 1,400 deg. C. with six burners, although three burners suffice to give the more usual requirement of 1,100 deg. C.

In an annexe to this building an abrasive wear machine has been developed capable of doing tests on rolling abrasion, sliding abrasion, cutting abrasion and friction rubbing in sand or carborundum.

Some Investigations.

Among the investigations carried out at Aachen may be mentioned Prof. Piwowarsky's work on superheating and on cupola operation, the influence of nickel and silicon on the displacement of the lines of the iron-carbon diagram, the influence of various elements on sensitiveness to wall thickness in cast iron, the growth of cast iron, the influence of arsenic and antimony on the properties of cast iron, and various investigations on malleable iron, steel castings and non-ferrous metals. Fig. 4 shows the apparatus for determining the growth of cast iron under a tensile load.

Notes from I.B.F. Branches.

The Lancashire Junior Section of the Institute of British Foundrymen held their monthly meeting on Saturday last, January 21, at the Manchester College of Technology, Mr. R. A. Jones in the chair. The lecturer was Mr. Coupe, of Rotherham, and the subject he dealt with was "A Few Notes on Cores."

The principal characteristics of a good core were summarised as follow:—Smooth face, free venting, resistance to wash and pressure of metal, ability to "give" when cast, to fettle easily, and to be non-scabbing. These, said the speaker, may be easy to sum up in theory, but yet sometimes hard to attain in practice. The ordinary sand core is necessary where the class of work is heavy in relation to the core. Generally speaking; the ordinary sand core calls for a higher standard of craftsmanship. The manner in which it is made is reflected in the appearance of the casting and the ease, or otherwise, with which it is fettled. This makes for individuality; the suitability of a sand and tackle for a given job is determined by experience. Such experience as applied to core-making is confined mainly amongst the older foundrymen, and cannot be acquired by the younger men to the same degree, owing to the introduction of the oil-sand core. Oil-sand cores give better all-round results in the way of ease of production, reduction of blown castings, a saving in coke, fettling costs, and reinforcing materials.

By capillary attraction, the oil being more or less viscous, agglomerates, or is drawn to the points of contact, where the grains of sand meet, thereby holding the core together by a film of substance, produced when the oil is oxidised during stoving. This leaves the interstices clear for the products of combustion to pass; the use of good oils or binders reduces the formation of gases.

Many people insist that it does not matter whether the sand is coarse or fine so long as the grains are of uniform size and round in shape. The lecturer, however, was of opinion that the coarse sand gives the better venting properties in practice. The use of a coarse or fine sand really depends upon the class of work to be dealt with.

Although it is well known that a blended sand gives a finer skin, it is at the expense of the permeability. One cannot be dogmatic regarding drying temperatures, as these vary with the type of binder used, but in the main small oil-sand cores can be dried rapidly with the maximum heat, but large oil-sand cores require a slow heat at first to drive out the moisture; then they can be finished off at the maximum. If this is exceeded for any length of time, the cores "burn," though actually it is the binder which burns or disintegrates. One sometimes hears of controversy as to the size an oil-sand core can be made without collapsing in the green state. Experience shows that if a good binder is used, they can be made practically any size and shape desired.

The limits are really imposed by the nature and thickness of the metal in relation to the core and its depth in the mould. Oil-sand cores should throw off a minimum amount of gas during stoving and casting, be strong enough to withstand any necessary handling in the green state, bake or stove as quickly as possible, and not absorb moisture when stoved.

To produce good cores that will result in satisfactory castings, the coremaker should understand the materials to be used in the making of the cores, the selection of which depends on the nature of the metal used, temperature at which it is cast, and the size and section of castings.

The speaker here used the example of a light-section brass bush and a heavy-phosphor-bronze ore. That an ordinary core as produced by a sausage machine would answer in the first case, but if used in the second, would probably result in a fused core. He said that in the second case an admirable core would be one of sieved compo and plumbago; this mixture should be worked on the dry side and would leave a clear hole.

A few examples were next taken of some cores used in steel work; the main differences between cores for non-ferrous, steel and iron were stressed. The temperature of steel sometimes necessitated the use of compo. Instances were given of cores burning off and fusing, and how these troubles were overcome by the use of chill at the narrow neck. Turning to cores used in iron moulding, a wide variety of cores were described and commented upon. The Paper was a very practical one, well illustrated by sketches and one just suited to the audience.

A vote of thanks was passed by the meeting, proposed by MR. A. BURGESS, seconded by MR. A. FLOWER.

In the discussion which followed, MR. BURGESS introduced the question of cores used in Diesel-engine work being correct in the mould, yet the resulting casting showed them to be cutting through, having warped, due to expansion. Mr. R. Yeoman produced, by the kindness of Mr. E. Longden, a large photograph of an oil-sand core, weighing 5 tons and 13 ft. in length, for a mould of a large horizontal boring machine casting made at Craven Brothers, Reddish.

MR. YEOMAN then raised the question of the difference in expansion between oil sand and ordinary core sand.

MR. JONES mentioned that he had come across cores being thin at the sides, due to sagging.

MR. HOLMES queried whether oil-sand cores needed venting.

The annual social of the Burnley Section of the Institute of British Foundrymen was held at Greenwood's Café, Todmorden Road, Burnley, on Saturday, January 14, 1933. There was a good attendance, including Mr. and Mrs. E. Flower, Mr. and Mrs. Roy Stubbs, and Mr. and Mrs. J. E. Cooke, of the Lancashire Branch. After tea the Burnley Section President, Mr. J. Taylor, welcomed the guests, to which both Mr. Flower and Mr. Stubbs replied. Whist playing followed, the prize-winners being:—Mrs. J. Wilkinson, Mrs. J. Pell, Mrs. M. Bateman, Mrs. Holland, and Miss Lowe; Mr. Myers, Mr. L. Wharton, Mr. Hollins, Mr. R. Stubbs, and Mr. H. Meadowcroft. Mrs. Flower presented the prizes, after which dancing filled in the remainder of the evening.

This Week's News in Brief.

Trade Talk.

MESSRS. YARROW & COMPANY, LIMITED, Scotstoun, Glasgow, have secured a contract, under the 1932 Admiralty programme, to build the gunboat "Robin." The contract, although a small one, will provide work for a considerable number of men for about six months.

THE CITY OF MANCHESTER having been divided into postal areas, correspondents are requested to include the district number in the address when corresponding with the general office of the Institute of British Foundrymen. The full postal address now is St. John Street Chambers, Deansgate, Manchester, 3.

MESSRS. J. PARISH & COMPANY, the Erith moulding-sand proprietors, announce the appointment of Mr. John Griffiths, "Bryncoed," Penllergaer, near Swansea, as their sole representative for South Wales. Mr. Griffiths is well known in the foundry trade, and is cordially at the disposal of those interested in foundry loam.

THE S.S. "VAN," of 8,722 gross tons, is due to arrive at the Carriden shipbreaking yard of Messrs. P. & W. MacLellan, Limited, Bo'ness, for breaking up. The "Van" was formerly the s.s. "Essex," built by Messrs. John Brown, Clydebank, for the Federal Steam Navigation Company in 1902. Sisterships, "Suffolk" and "Dorset," were both broken up in the same yard recently.

MESSRS. A. & J. INGLIS, LIMITED, Pointhouse Shipbuilding Yard, Glasgow, have received orders from the L.N.E. Railway Company to overhaul six of their Clyde service steamers in preparation for the summer programme. The L.N.E.R. have also placed an order with Messrs. Henry Robb & Company, Limited, Leith, for the overhaul of the Firth of Forth steamer "William Muir."

AS A RESULT of the audit of the employers' books for the three months ended December 31, 1932, the net selling price of pig-iron in Scotland is shown to have been £3 5s. 9d. per ton. The Board of Conciliation for the regulation of wages in the Scottish pig iron trade in Scotland have received intimation that there will be a reduction of 2 per cent. in the wages of workmen on basis rate.

THE IMPORT DUTIES ADVISORY COMMITTEE give notice of an application for drawback under Section 9 of the Finance Act, 1932, in the case of stainless-steel sheets of austenitic (18 and 8) quality from 3 to 26 S.W.G. in thickness, in respect of the billets or slabs of stainless steel used in their manufacture. Any representations which interested parties desire to make in regard to the application should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, London, S.W.1, not later than February 6.

THE ENGLISH STEEL CORPORATION, LIMITED, Sheffield, are reorganising their forge department. The contract for all the furnaces has been placed with Messrs. G. P. Wincott, Limited, Sheffield, and at the moment amounts to ten producer-gas-fired regenerative furnaces, for ingot heating. The design will permit of the handling of very large ingots and represents latest practice. It will be recalled that Messrs. G. P. Wincott, Limited, are building three Siemens open-hearth furnaces for the English Steel Corporation, Limited. This installation is nearing completion.

NOTICE IS GIVEN by the Barrow Hematite Steel Company, Limited, that the scheme of arrangement between the company and the debenture stockholders, shareholders and others enabled the company to create an issue of £250,000 7 per cent. prior lien short-term notes, the proceeds to be applied in redemption of the second-mortgage debenture of the company and for the general purposes of the company. The notes are repayable at par on December 31, 1950, or earlier on three months' notice, and redeemable by means of a cumulative sinking fund commencing in 1936. £215,000 of the notes have already been issued or are in course of issue, and the balance of £35,000 of the notes are now offered (in the first instance) to the debenture stockholders and shareholders of the company for subscription at £90 per £100 (payable £10 on application and £80 on allotment) and at the same rate for the smaller denominations.

Personal.

PROF. J. D. CORMACK, Regius Professor of Civil Engineering in the University of Glasgow, has been appointed President of the Institution of Engineers and Shipbuilders in Scotland in place of Mr. Archibald Gilchrist, who died recently.

PROF. JOHN DEWAR CORMACK has been elected President of the Institution of Engineers and Shipbuilders in Scotland, in succession to the late Mr. Archibald Gilchrist. The new president is Regius Professor of Civil Engineering and Mechanics at Glasgow University.

MR. FRANK BAXTER, of Messrs. Baxter, Fell & Company, has been elected chairman of the Management Committee of the London Iron and Steel Exchange in succession to Mr. Cyril Watts (South Wales Tinplate Corporation, Limited), whose term of office has expired.

MR. HAROLD S. ASPINALL has resigned his position as the London director of Messrs. Petters, Limited, and joined the English Electric Company, Limited, as manager of Diesel-engine sales. From 1923 to 1928, Mr. Aspinall was director and general manager of Messrs. Vickers-Petters, Limited, Ipswich.

Wills.

MR. ROBERT PAUL, iron merchant, Glasgow £16,123

Contracts Open.

Biggleswade, February 24.—Large pump and oil-driven engine, for the Biggleswade Water Board. Sir A. Binnie, Son & Deacon, Artillery House, Artillery Row, Westminster, S.W.1. (Fee £10, returnable.)

Cairo, March 1.—Seven pumps of various types, etc., for the Egyptian Ministry of the Interior. The Department of Overseas Trade. (Reference G.X. 12,190.)

Cairo, February 28.—Supplying and laying cast-iron and steel mains at Cairo, for the Main Drainage Department, No. 2, Sharia El Maleka Nazli, Cairo. The Inspecting Engineer to the Egyptian Government, 41, Tothill Street, London, S.W.1.

Harrogate, January 28.—80 tons of 18-in. int. dia. cast-iron pipes, in 12-ft. lengths, for the Town Council. Mr. A. S. West, waterworks engineer and manager, Municipal Offices, Harrogate.

Southport, February 13.—Iron and steel stores, castings, etc., for the Corporation. Mr. A. E. Jackson, borough engineer and surveyor, Town Hall, Southport.

Company Reports.

Qualcast, Limited.—Interim dividend of 5 per cent.

Hopkinsons, Limited.—Dividend on the 7 per cent. cumulative preference shares for half-year ending January 31.

Westinghouse Brake & Saxby Signal Company, Limited.—Net profit, £65,128; dividend of 3½ per cent. for year.

Hadfields, Limited.—The directors have resolved to defer payment of the dividend on the preference shares due on December 31.

Brightside Foundry & Engineering Company, Limited.—The directors have decided to defer payment of the dividend on the preference shares.

Atlas Steel Foundry & Engineering Company, Limited.—Loss to September 30, £4,903; brought in, £1,527; debenture sinking fund provision, £1,500; from general reserve, £5,000; depreciation, £1,500; debit balance carried forward, £1,376.

Crittall Manufacturing Company, Limited.—Profit, £68,271, after transfer from contingency account, no longer required (£11,501); brought in, £17,676; debenture interest, £30,000; notes interest, £45,000; preference share dividend to November 30, 1931, £8,750; credit balance carried forward, £2,197.

Patent Specifications Accepted.

The following list of Patent Specifications accepted has been taken from the "Illustrated Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The last numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken

13,181. BABCOCK & WILCOX, LTD. (Babcock & Wilcox Co.). Process of and apparatus for electrically welding joints or seams by means of an electric arc. 379,723.

16,454. DEUTSCHE GOLD- UND SILBERSCHEIDEANSTALT VORM. ROESSLER. Cementation of iron and steel and their alloys. 379,752.

18,303. UNITED STEEL COS., LTD., and MASON, B. G. Sleepers for railway rails. 379,793.

6,292. ROBBINS, W. A., JONES, S. A. A., and JONES, E. H. Manufacture of chilled rolls. 379,990.

6,765. FRAUENKNECHT, H. Method for the preparation of briquettes for introducing manganese and silicon in cupola castings. 379,994.

7,838. DIESCHER, S. E., and DIESCHER, A. P. (trading as DIESCHER & SONS, S.). Manufacture of seamless tubing. 380,000.

10,928. BERGES, C., and BERGES, W. Machines for pressing, bending, cutting and stamping sheet metal. 380,019.

Applications for Trade Marks.

The following list of applications to register trade marks is extracted from the "Trade Marks Journal":—

"ALSICA."—Metallic alloys. British Foundry Units, Limited, 52, Bedford Row, London, W.C.1.

"VAREXO."—Metals. J. B. Corrie & Company, Limited, 15, Victoria Street, London, S.W.1.

"TELCON."—Metals The Telegraph Construction & Maintenance Company, Limited, 38, Old Broad Street, London, E.C.2.

"RESISCO." — Unwrought and partly-wrought metals. I.C.I. Metals, Limited, manufacturers, Lion Works, Witton, Birmingham.

"EPOK."—Metals. Thos. Firth & John Brown, Limited, Norfolk Works, Savile Street, Sheffield.

New Companies.

Nickel Blanks Company, Limited, 11, Chester Street, Sheffield.—Capital £3,000. Directors: E. Oldfield and H. B. Green.

Cochranes (Bo'ness), Limited, Seaview Ironworks, 14, Commissioner Street, Bo'ness.—Capital, £2,000. Engineers. Directors: J. P., T. P., and D. A. Cochrane.

Bright Steel Company (Oldbury), Limited, West Bromwich Street, Oldbury, Worcs.—Capital £2,000. Directors: D. W. and E. J. Orchard, T. G. Hunt and H. Cooper.

T. & J. Brettell, Limited, Spon Lane Foundry, Spon Lane, West Bromwich.—Capital £2,000. Ironfounders. Directors: C. P. Cook, Kate A. Brettell, Glendowra A. Cook and Glendowra E. Cook.

Rust Prevention with Lanoline.—For over five years the National Physical Laboratory has carried out a series of investigations for the Engineering Research Board of the Department of Scientific and Industrial Research on the value of lanoline and lanoline mixtures as rust-preventing coatings on steel. Tests were made with nuts and bolts drawn from store, which were dipped, after cleaning, in a shallow tray filled with the preservative. After draining on a wire-mesh sieve for about an hour, the pieces were ready for storage trials. The most stringent of the various tests applied were those in the ammonium nitrate shed at the Government factory at Hereford, where unprotected steel pieces rusted in six months, but the greater number of the lanoline-coated pieces was unaffected by atmospheric conditions throughout the full five years.

Raw Material Markets.

Business in the iron and steel markets is opening up at a fairly steady rate, and there is a general feeling of confidence that better conditions will shortly be witnessed. Pig-iron consumers have been interested in discussions taking place between the producers with a view to eliminating uneconomic competition in the home markets. This has ended in the Middlesbrough producers agreeing to quote uniform delivered prices for their iron throughout a certain area. Further developments are expected. Revised and more comprehensive selling agreements are also to be made between the makers of certain heavy steel products. Meetings of the Continental Steel Cartel are being held with a view to establishing selling syndicates for handling the sales of Continental products. In the long run this should benefit our domestic steel market.

Pig-Iron.

MIDDLESBROUGH.—The outstanding development of the past week has been the abandonment of the quotation for No. 3 G.M.B., which has stood at 58s. 6d. for the last two years. By agreement with their Midland competitors, the Cleveland ironmasters are now quoting No. 3 at 62s. 6d. per ton delivered in a specified area embracing the North-East Coast. This will be considerably to the advantage of those consumers on the fringe of this area, but to the detriment of Middlesbrough consumers, who will lose what territorial advantage they formerly held. Other quotations now are 65s. for Cleveland No. 1, 61s. 6d. for No. 4 foundry and 61s. for No. 4 forge, delivered in the specified area. It is understood that the quotations for delivery in Scotland will be raised accordingly. Export figures remain unchanged. These developments have, to a certain extent, upset the market, and trade has been very restricted.

Actual selling prices have weakened somewhat in the East Coast hematite market, although the producers' quotations nominally remain at 59s. per ton. This figure is being shaded by holders, and the producers are going to find it difficult to maintain prices without an agreement amongst themselves, embarrassed as they are by increasing stocks and a poor demand, both from the home and overseas markets.

LANCASHIRE.—Deliveries of foundry iron to consumers in this area have been maintained at a fair level, but there is little disposition to enter into new business. The general price position is maintained, current offers for delivery to works in the Manchester district being on the basis of 67s. per ton for Staffordshire and Derbyshire brands of No. 3 iron, 65s. 6d. for Northamptonshire, 62s. for Derbyshire forge, around 82s. for Scottish foundry, 75s. 6d. for East Coast hematite, and 81s. for West Coast hematite. Dealing in Cleveland iron has virtually ceased for the moment, following the news of the marketing arrangements made between the Cleveland and Midland producers. In any case, little Cleveland iron had been entering this district for some time past.

MIDLANDS.—The demand for pig-iron remains slow, in fact, disappointingly so. A number of the lighter trades have apparently not yet picked up their normal rates of activity since the holiday interval. It is reported that the makers are having to put more pig-iron into stock. Prices are unaltered at 62s. 6d. for Northamptonshire No. 3 and 66s. for Derbyshire, North Staffordshire and Lincolnshire No. 3, including delivery to Birmingham and Black Country stations. A little Cleveland No. 3 was recently still being offered at 66s. delivered Birmingham stations, but later developments have virtually stopped business. West Coast hematite, No. 3 or mixed numbers, is controlled at 84s. 6d. per ton delivered works in South Staffordshire. Welsh and East Coast hematite is offered at 75s. 6d. up to 80s., according to tonnage and analysis.

SCOTLAND.—Delivery orders against current contracts are coming in very slowly in this area, and new business is in an equally poor position. The price of No. 3 foundry iron remains unchanged at 67s. 6d. f.o.t. furnaces, with a minimum of 2s. 6d. extra for No. 1. A few small lots of Middlesbrough iron were recently booked on the basis of 54s. or thereabouts at Falkirk. Other English irons were offered at a little less, but the amount of business actually taken was very small. Prices are now some shillings higher following the marketing agreements between the English producers in the Midlands and on the North-East Coast.

Coke.

The market remains quiet. Few consumers are willing to contract forward, although they could do so at present rates, which are:—Best Durham fuel, 36s. 6d. to 38s.; Welsh coke, 30s. to 45s., according to analysis and tonnage, delivered Birmingham and Black Country stations.

Steel.

Steady and rather quiet conditions rule in the steel market. Most of the important home trade buyers have filled their requirements for the moment and export buying is limited by restrictions which prevent a number of markets fully replenishing stocks. The Far-Eastern markets have been active of late and considerable orders for steel materials have been placed on the Continent and in this country. In the semi-finished steel market, conditions remain quiet, and users continue to buy from hand to mouth. Substantial stocks exist at most of the works, and consumers are disinclined to commit themselves to large purchases in the present state of the market. Only occasional purchases of foreign material are heard of, and Continental competition in the home market on an important scale seems to be a thing of the past. Business in finished-steel materials is irregular. The scarcity of orders for shipbuilding and engineering material is being severely felt, but in one or two departments fairly active conditions rule. The export trade seems to be gradually expanding.

Scrap.

The Cleveland scrap-iron market is stationary at the moment, consumers having apparently satisfied their immediate needs. Elsewhere, the markets have firmed up considerably, however. In South Wales, heavy cast iron meets with a ready sale at 42s. 6d. to 45s. per ton, with light cast iron at 39s. to 40s. Machinery scrap in foundry sizes is rather sluggish at the current level of 47s. 6d. to 50s. In the Midlands, heavy machinery metal is offered at 47s. 6d., and good heavy pipe and plate scrap at 5s. per ton less. Light cast-iron scrap is scarce, 37s. 6d. per ton now being offered. The demand has also improved in Scotland, where machinery scrap in pieces not exceeding 1 cwt. is firm at 47s. 6d., with ordinary heavy cast iron to the same specification at 42s. to 44s. per ton.

Metals.

Copper.—Offers of electrolytic copper have been heavier and values fell slightly, but very few consumers were willing to buy. The market appears particularly dead at the moment. Conditions have now reached the stage when, attempts at artificial control having been abandoned, there is nothing to do but await a doubtful expansion in the industrial demand, sufficient to make some impression on the immense stocks with which the market is now saddled. There are many sellers who are willing to cut prices in the endeavour to secure business.

Prices have been :—

Cash.—Thursday, £28 2s. 6d. to £28 5s.; Friday, £28 6s. 3d. to £28 7s. 6d.; Monday, £28 16s. 3d. to £28 17s. 6d.; Tuesday, £28 11s. 3d. to £28 12s. 6d., Wednesday, £28 13s. 9d. to £28 15s.

Three Months.—Thursday, £28 8s. 9d. to £28 10s.; Friday, £28 12s. 6d. to £28 13s. 9d.; Monday, £29 1s. 3d. to £29 2s. 6d.; Tuesday, £28 16s. 3d. to £28 18s. 9d.; Wednesday, £28 17s. 6d. to £28 18s. 9d.

Tin.—The market does not show any particular feature at the moment, prices remaining just about steady. A fair rate of consumption is being maintained, especially in the South Wales area, but the demand is not definite enough to give any signs of really improved conditions in the future.

Prices of standard tin have been :—

Cash.—Thursday, £144 5s. to £144 10s.; Friday, £145 to £145 2s. 6d.; Monday, £145 10s. to £145 15s.; Tuesday, £145 12s. 6d. to £145 15s.; Wednesday, £146 17s. 6d. to £147.

Three Months.—Thursday, £145 to £145 5s.; Friday, £145 12s. 6d. to £145 15s.; Monday, £146 2s. 6d. to £146 5s.; Tuesday, £146 2s. 6d. to £146 5s.; Wednesday, £147 7s. 6d. to £147 10s.

Spelter.—It is reported that the International Zinc Cartel has been renewed for a further period of three months, until April 30. The usual difficulties in holding a producers' combine together during a period of extreme depression are being experienced, the stronger being inclined to abandon the weaker, but the market has been partly assured by the renewal.

Price fluctuations :—

Ordinary.—Thursday, £14 8s. 9d.; Friday, £14 3s. 9d.; Monday, £14 6s. 3d.; Tuesday, £14 6s. 3d.; Wednesday, £14 7s. 6d.

Lead.—This metal is in rather a poor position at the moment. Business with consumers has fallen away slightly, while a definite increase in imports has not improved matters. The further sending of lead to Britain from Germany indicates the poor position of the lead-manufacturing industries on the Continent.

Daily market prices :—

Soft Foreign (Prompt).—Thursday, £10 5s.; Friday, £10 5s.; Monday, £10 10s.; Tuesday, £10 10s.; Wednesday, £10 13s. 9d.

Craven Machine Tool Gazette.—Messrs. Craven Brothers (Manchester), Limited, have this month issued the first number of a quarterly house journal with the title "The Craven Machine Tool Gazette." This well-produced and illustrated number includes a foreword by MR. R. GREENWOOD, the managing director of Messrs. Craven Bros., outlining the development of the firm; descriptions of the giant "Craven" 50-in. centre double-heavy high-speed roughing lathe, and of the hollow-forged reaction chambers manufactured by Messrs. Thos. Firth & John Brown, Limited, for Trinidad and finished on this large lathe; and short articles on production, machine-tool and staff matters.

CAST IRON FLANGED PIPES
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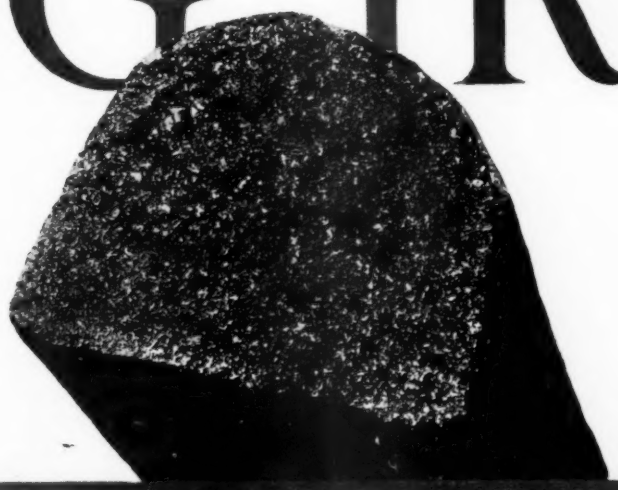
PIG IRON



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ELECTRIC SAND RIDDLE

The running cost is negligible and it riddles as fast as a man can feed it. Equipped with a ½-h.p. motor, for A.C. or D.C. as desired. Motor and all working parts protected from sand. Easily wheeled to any part of the foundry.

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WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	28	13	9
Three months	28	17	6
Electrolytic	32	15	0
Tough	30	0	0
Best selected	30	10	0
Sheets	61	0	0
India	41	10	0
Wire bars	33	0	0
Do., Feb.	33	2	6
Do., March	33	5	0
Ingot bars	33	0	0
H.C. wire rods	35	15	0
Off. av. cash, December	29	2	7½
Do., 3 mths., December	29	9	7⅝
Do., Sttlmnt., December	29	2	4½
Do., Electro, December	34	12	2½
Do., B.S., December	32	3	7⅓
Do., wire bars, December	34	17	6
Solid drawn tubes			9½d.
Brazed tubes			9½d.
Wire			6½d.

BRASS.

Solid drawn tubes	8½d.
Brazed tubes	10½d.
Rods, drawn	7½d.
Rods, extd. or rlld.	4½d.
Sheets to 10 w.g.	7½d.
Wire	7½d.
Rolled metal	7d.
Yellow metal rods	4½d.
Do. 4 × 4 Squares	5½d.
Do. 4 × 3 Sheets	5¼d.

TIN.

	£	s.	d.
Standard cash	146	17	6
Three months	147	7	6
English	148	0	0
Bars	149	5	0
Straits	151	2	6
Australian	148	12	6
Eastern	150	5	0
Banca	151	12	6
Off. av. cash, December	149	17	9¾
Do., 3 mths., December	151	1	0¾
Do., Sttlmt., December	149	18	6

SPELTER.

	£	s.	d.
Ordinary	14	7	6
Remelted	14	0	0
Hard	12	5	0
Electro 99.9	17	0	0
English	15	5	0
India	14	0	0
Zinc dust	21	0	0
Zinc ashes	2	15	0
Off. aver., December	15	5	6¾
Aver. spot, December	15	4	2¼

LEAD.

	£	s.	d.
Soft foreign ppt.	10	13	9
Empire	10	16	3
English	12	0	0
Off. average, December	11	6	10½
Average spot, December	12	2	10½

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	24	10	0
Do., V.M. ex-whse.	24	5	0
Rods	27	0	0
Boiler plates	23	0	0
Battery plates		—	

ANTIMONY.

	£	s.	d.		£	s.	d.
English	37	10	0	to 42	10	0	
Chinese				27	17	6	
Crude		—					

QUICKSILVER.

	£	s.	d.
Quicksilver	10	5	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro silicon—	
25%	£8 0 0
45/50%	£13 15 0
75%	£19 10 0
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free of Mo.	6/3 per lb.
Ferro-titanium—	
23/25% carbon-free	10d. lb.
Ferro-phosphorus, 20/25%	£18 7 6
Ferro-tungsten—	
80/85%	1/7½ lb.
Tungsten metal powder—	
98/99%	1/10½ lb.
Ferro-chrome—	
2/4% car.	£32 10 0
4/6% car.	£25 0 0
6/8% car.	£22 17 6
8/10% car.	£23 10 0
Ferro-chrome—	
Max. 2% car.	£35 15 0
Max. 1% car.	£39 12 6
Max. 0.70% car.	£43 12 6
70% carbon-free	1/- lb.
Nickel—99.5/100%	£245 to £250
"F" nickel shot	£220 0 0
Ferro-cobalt	7/3 lb.
Aluminium 98/99%	£100 0 0
Metallic chromium—	
96/98%	2/9 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0 to £11 5 0
76/80% packed	£11 15 0 to £12 5 0
76/80% export	(nom.) £9 15 0
Metallic manganese—	
94/96% carbon-free	1/4 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 5/16 in.	1/- lb.
Flats, ¼ in. × ½ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

South Wales—	£	s.	d.		£	s.	d.
Heavy steel	2	1	6	to	2	2	6
Bundled steel and shrngs.	1	16	0	to	1	19	0
Mixed iron and steel	1	15	0	to	1	19	0
Heavy cast iron	2	2	6	to	2	5	0
Good machinery	2	7	6	to	2	10	0
Cleveland—							
Heavy steel	1	17	6	to	2	0	0
Steel turnings					1	12	6
Cast-iron borings					1	3	6
Heavy forge					2	10	0
W.I. piling scrap					2	2	6
Cast-iron scrap	2	0	0	to	2	3	0
Midlands—							
Light cast-iron scrap					1	17	6
Heavy wrought iron					2	5	0
Steel turnings, f.o.r.					1	1	0
Scotland—							
Heavy steel					1	17	6
Ordinary cast iron	2	2	6	to	2	4	0
Engineers' turnings					1	10	0
Cast-iron borings					1	12	0
Wrought-iron piling					2	5	0
Heavy machinery					2	7	6

London—Merchants' buying prices delivered yard.

	£	s.	d.
Copper (clean)	21	0	0
Brass	14	0	0
Lead (less usual draft)	9	0	0
Tea lead	7	10	0
Zinc	8	10	0
New aluminium cuttings	72	0	0
Braziery copper	19	0	0
Gunmetal	18	0	0
Hollow pewter	80	0	0
Shaped black pewter	60	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast (d/d district)—	
Foundry No. 1	65/-
Foundry No. 3	62/6
,, at Falkirk	—
Foundry No. 4	61/6
Forge No. 4	61/-
Hematite No. 1, f.o.t.	59/6
Hematite M/Nos., f.o.t.	59/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	69/-
,, d/d Birm.	84/6
Malleable iron d/d Birm.	117/6
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	62/-
,, No. 3 fdry.	66/-
Northants forge	58/6
,, fdry. No. 3	62/6
,, fdry. No. 1	65/6
Derbyshire forge	62/-
,, fdry. No. 3	66/-
,, fdry. No. 1	69/-
,, basic	—
Scotland—	
Foundry No. 1	70/-
,, No. 3	67/6
Hem. M/Nos. d/d	66/-
Sheffield (d/d district)—	
Derby forge	59/6
,, fdry. No. 3	63/6
Lincs forge	59/6
,, fdry. No. 3	63/6
E.C. hematite	73/6
W.C. hematite	83/6
Lancashire (d/d eq. Man.)—	
Derby forge	62/-
,, fdry. No. 3	67/-
Staffs fdry. No. 3	67/-
Northants fdry. No. 3	65/6
Cleveland fdry. No. 3	—
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	82/-
Clyde, No. 3	82/-
Monkland, No. 3	82/-
Summerlee, No. 3	82/-
Eglinton, No. 3	82/-
Gartsherrie, No. 3	82/-
Shotts, No. 3	82/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.		£	s.	d.
Bars (cr.)	9	0	0	to	9	15	0
Nut and bolt iron	7	15	0	to	8	0	0
Hoops	10	10	0	to	12	0	0
Marked bars (Staffs) f.o.t.					12	0	0
Gas strip	10	10	0	to	12	0	0
Bolts and nuts, ¾ in. × 4 in.					12	10	0
Steel—							
Plates, ship, etc.	8	15	0	to	8	17	6
Boiler plts.	8	0	0	to	9	0	0
Chequer plts.					10	7	6
Angles					8	7	6
Tees					9	7	6
Joists					8	15	0
Rounds and squares, 3 in. to 5½ in.					9	7	6
Rounds under 3 in. to ¼ in. (Untested)					6	15	0 & up.
Flats—8 in. wide and over					8	12	6
,, under 8 in. and over 5 in.					8	17	6
Rails, heavy	8	5	0	to	8	10	0
Fishplates					12	0	0
Hoops (Staffs)	9	10	0	& up.			
Black sheets, 24g. (10-t. lots)					9	10	0
Galv. cor. shts.					11	15	0
Galv. flat shts.					12	5	0
Galv. fencing wire, 8g. plain					14	0	0
Billets, soft	4	17	6	to	5	7	6
Billets, hard	6	12	6	to	7	2	6
Sheet bars	4	15	0	to	5	2	6
Tin bars					4	15	0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	10½d.
Sheet to 10 w.g.	11½d.
Wire	11⅝d.
Rods	10½d.
Tubes	16d.
Castings	12½d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1⅝ to 1/7⅝
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	13.34
No. 2 foundry, Valley	14.50
No. 2 foundry, Birm.	11.00
Basic	15.39
Bessemer	16.89
Malleable	16.39
Grey forge	16.39
Ferro-mang. 80%, seaboard	68.00
O.-h. rails, h'y, at mill	40.00
Billets	26.00
Sheet bars	26.00
Wire rods	37.00
	Cents.
Iron bars, Phila.	1.86
Steel bars	1.60
Tank plates	1.60
Beams, etc.	1.60
Skelp, grooved steel	1.60
Steel hoops	1.55
Sheets, black, No. 24	2.00
Sheets, galv., No. 24	2.75
Wire nails	1.95
Plain wire	2.20
Barbed wire, galv.	2.60
Tinplates, 100-lb. box	$4.75

COKE (at ovens).

Welsh foundry	20/- to 22/6
,, furnace	16/- to 16/6
Durham and Northumberland—	
,, foundry	21/- to 25/-
,, furnace	13/6 to 13/9
Midlands, foundry	—
,, furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box		16/-
,,	28×20 ,,		32/-
,,	20×10 ,,		23/-
,,	18¾×14 ,,		16/7½
C.W.	20×14 ,,		14/-
,,	28×20 ,,		29/3 to 29/6
,,	20×10 ,,		19/10
,,	18¾×14 ,,		14/-

SWEDISH CHARCOAL IRON & STEEL.

	£	s.	d.		£	s.	d.
Pig-iron	6	0	0	to	7	0	0
Bars-hammered, basis	16	10	0	to	17	0	0
Bars and nail-rods, rolled, basis	15	17	6	to	16	5	0
Blooms	10	0	0	to	12	0	0
Keg steel	32	0	0	to	33	0	0
Faggot steel	18	0	0	to	23	0	0
Bars and rods dead soft, st'l	10	0	0	to	12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.	
Jan. 19 ..	28	2	6	dec.	2/6
,, 20 ..	28	6	3	inc.	3/9
,, 23 ..	28	16	3	,,	10/–
,, 24 ..	28	11	3	dec.	5/–
,, 25 ..	28	13	9	inc.	2/6

Electrolytic Copper.

		£	s.	d.	
Jan. 19 ..	33	0	0	No change	
,, 20 ..	33	0	0	,,	,,
,, 23 ..	33	0	0	,,	,,
,, 24 ..	32	15	0	dec.	5/–
,, 25 ..	32	15	0	No change	

Standard Tin (cash).

		£	s.	d.		
Jan. 19 ..	144	5	0	dec.	35/–	
,, 20 ..	145	0	0	inc.	15/–	
,, 23 ..	145	10	0	,,	10/–	
,, 24 ..	145	12	6	,,	2/6	
,, 25 ..	146	17	6	,,	25/–	

Tin (English ingots).

		£	s.	d.		
Jan. 19 ..	145	10	0	dec.	35/–	
20 ..	146	0	0	inc.	10/–	
,, 23 ..	146	15	0	,,	15/–	
,, 24 ..	146	15	0	No change		
,, 25 ..	148	0	0	inc.	25/–	

Spelter (ordinary).

		£	s.	d.		
Jan. 19 ..	14	8	9	dec.	3/9	
,, 20 ..	14	3	9	,,	5/–	
,, 23 ..	14	6	3	inc.	2/6	
,, 24 ..	14	6	3	No change		
,, 25 ..	14	7	6	inc.	1/3	

Spelter (Electro, 99.9 per cent.).

		£	s.	d.		
Jan. 19 ..	17	2	6	dec.	5/–	
,, 20 ..	16	17	6	,,	5/–	
,, 23 ..	17	0	0	inc.	2/6	
,, 24 ..	17	0	0	No change		
,, 25 ..	17	0	0	,,	,,	

Zinc Sheets (English).

		£	s.	d.		
Jan. 19 ..	24	10	0	No change		
,, 20 ..	24	10	0	,,	,,	
,, 23 ..	24	10	0	,,	,,	
,, 24 ..	24	10	0	,,	,,	
,, 25 ..	24	10	0	,,	,,	

Lead (English).

		£	s.	d.		
Jan. 19 ..	11	15	0	No change		
,, 20 ..	11	15	0	,,	,,	
,, 23 ..	12	0	0	inc.	5/–	
,, 24 ..	12	0	0	No change		
,, 25 ..	12	0	0	,,	,,	

AVERAGE PRICES OF GALVANISED CORRUGATED SHEETS (NORTH OF ENGLAND).

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1902	12 0 0	11 10 0	11 10 0	11 10 0	11 15 0	11 15 0	11 15 0	11 15 0	11 15 0	11 15 0	11 15 0	11 15 0	11 14 2
1903	11 5 0	11 5 0	11 5 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 5 0	11 5 0	11 5 0	11 5 0	11 7 1
1904	11 5 0	11 5 0	11 5 0	11 5 0	10 15 0	10 15 0	10 15 0	10 15 0	10 5 0	10 5 0	10 5 0	10 5 0	10 15 0
1905	10 7 6	10 7 6	10 7 6	10 7 6	10 7 6	10 7 6	10 7 6	10 7 6	11 0 0	11 5 0	11 15 0	12 0 0	10 15 0
1906	12 12 6	12 12 6	12 12 6	12 7 6	12 7 6	12 7 6	12 12 6	12 12 6	12 15 0	12 15 0	12 15 0	13 5 0	12 12 11½
1907	13 5 0	13 5 0	13 15 0	13 15 0	13 15 0	13 15 0	13 17 6	13 17 6	13 17 6	13 2 6	13 2 6	13 2 6	13 10 10
1908	13 2 6	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 11 0½
1909	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	10 10 0	11 0 0	11 0 0	11 0 0	11 0 0	11 16 8
1910	11 15 0	12 5 0	12 5 0	11 15 0	11 10 0	11 10 0	11 12 6	11 12 6	11 12 6	11 12 6	11 10 0	11 10 0	11 18 4
1911	11 5 0	11 1 3	10 15 0	10 15 0	10 13 9	10 10 0	10 13 9	11 0 0	11 5 0	11 5 0	11 5 0	11 7 0	10 19 7½
1912	11 10 0	11 10 0	11 10 0	11 15 0	12 5 0	12 5 0	12 5 0	12 5 0	12 5 0	12 12 6	12 18 0	12 15 0	12 2 11½
1913	12 15 0	12 15 0	12 15 0	12 11 3	11 18 0	11 15 0	11 15 0	11 15 0	11 15 0	11 3 0	11 0 0	11 2 6	11 18 4
1914	11 7 0	11 7 6	11 7 6	11 5 7½	11 2 6	10 15 0	10 15 0	12 17 6	14 2 0	13 7 0	11 15 7	11 2 6	11 16 0
1915	11 10 8½	13 12 6	14 8 9	15 0 6	17 17 6	20 17 6	20 17 6	20 6 3	17 12 6	18 1 0	22 13 9	25 2 0	18 3 4½
1916	26 5 0	27 12 6	28 0 0	28 5 0	29 0 0	29 0 0	28 15 0	28 3 0	28 15 0	28 15 0	28 15 0	28 15 0	28 6 8½
1917	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 0 0	28 0 0	28 0 0	28 11 3
1918	28 5 0	28 15 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	28 13 4
1919	29 0 0	29 0 0	29 0 0	28 0 0	28 10 0	27 7 6	27 5 0	29 3 0	32 0 0	33 0 0	36 10 0	40 8 4	31 5 3½
1920	46 10 0	49 15 0	53 15 0	56 0 0	55 10 0	54 10 0	52 10 0	48 10 0	44 3 4	39 2 6	35 17 6	30 8 0	47 4 3
1921	28 10 0	25 17 6	24 5 0	23 3 4	22 0 0	22 0 0	23 10 0	21 12 6	20 0 0	18 15 0	18 3 9	17 2 0	22 1 7
1922	16 17 6	15 13 9	16 3 0	16 10 0	16 4 4½	15 15 6	15 16 3	16 16 0	16 8 9	16 6 3	17 1 0	17 7 6	16 7 5½
1923	18 3 1½	19 1 11½	19 8 0	19 10 0	19 7 0	19 1 3	18 0 0	18 13 1½	19 0 0	19 3 9	19 2 6	18 19 4½	18 19 2
1924	18 13 6	18 9 4½	18 5 0	17 15 11½	17 3 0	17 19 4½	18 7 6	18 8 1½	18 8 1½	17 19 6	17 11 3	17 10 0	18 0 10½
1925	17 8 6	17 1 6½	16 9 4½	16 12 0	16 9 8½	16 9 4½	16 0 6	16 1 10½	16 5 0	16 7 0	16 12 6	6 15 0	16 11 0½
1926	16 14 4½	16 5 7½	16 0 6	15 11 10½	15 11 3	16 0 0	16 16 0	16 18 9	16 14 0	16 18 9	17 10 0	6 19 0	16 10 0½
1927	16 3 1	15 7 6	15 3 3	15 3 1½	14 14 4½	14 11 6	14 1 10½	14 0 0	13 19 6	13 16 10½	13 13 1½	13 3 9	14 9 10
1928	13 0 0½	13 2 6	13 6 0	13 2 6	13 3 0	13 6 9	13 11 3	13 10 0	13 10 7½	13 12 6	13 11 6	13 10 0	13 8 8½
1929	13 11 0	13 13 1½	13 12 9½	13 10 11½	13 9 3	13 8 9	13 11 6	13 7 6	13 5 6	12 18 9	12 12 9½	13 7 5½
1930	12 5 0	11 15 0	11 19 6	11 18 7	11 18 0	11 17 6	11 17 6	11 17 6	11 16 3	11 12 6	11 8 9	11 5 0	11 15 11½
1931	11 4 0	11 0 0	11 0 0	11 0 0	10 13 9	9 18 9	9 13 0	9 5 3½	8 19 0½	9 16 0	9 8 9	9 4 0½	10 1 10½
1932	9 2 9	9 14 4½	9 16 0	9 13 9	9 12 6	9 12 6	9 11 0	9 4 4½	9 11 3	10 12 6	11 5 0	11 7 0	9 18 7

WILLIAM JACKS & COMPANY,

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13, RUMFORD STREET, LIVERPOOL.

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REGISTERED TRADE MARK

All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

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COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

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(A remittance should accompany instructions.)

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ADVERTISER desires position as Foundry Manager or Foreman; practical, technical and commercial training all branches foundry work, thorough knowledge of metallurgy and mixing of metals; can take entire charge.—Box 318, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

BRASS FOUNDRY FOREMAN desires position; experienced in Admiralty contracts, gunmetal, phos. bronze and manganese castings; 12 years foreman in last situation.—Box 258, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY SUPERINTENDENT of the B.T.-H. Company, Limited, Rugby, has resigned his position, and would be glad to hear from anyone who can make use of his services. Highest references. Iron and non-ferrous. Age 42. Life experience.—HAINES, 46, Claremont Road, Rugby.

EMPLOYMENT REGISTER.

Conducted by the Institute of British Foundrymen by courtesy of the proprietors of THE FOUNDRY TRADE JOURNAL.

Correspondence should be addressed to the General Secretary, Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, from whom full particulars can be obtained of this service.

Any employer wishing to communicate with a candidate should write to the General Secretary, quoting identification number.

PRACTICAL Foundry Manager desires engagement. Wide and varied experience, machine tools, light castings, turbine and engine work. Rotary furnace experience. (204)

POSITION required as Works or Foundry Manager, or as Representative. Wide experience in ferrous and non-ferrous foundries with first-class firms. Highest credentials. (205)

YOUNG Foundry Manager requires position or as Assistant. Good general and technical education, sound experience as Moulder and in supervisory capacity. (206)

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SHEFFIELD.

145,000 Sq. Ft. of Shops.

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THE Owner of British Patent No. 304302, relating to "Improvements in Ingot Moulds," is desirous of entering into negotiations for the grant of licences or otherwise, under suitable terms, for the purpose of exploiting the invention and ensuring its full development and practical working in this country. —For particulars, address, ARTHUR SADLER, 65, Temple Row, Birmingham.

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FOUNDRY PLANT FOR SALE.

Pneulec Rotary Sand Drying Plant, output 1 ton per hour.

No. 9 "Ajax" Pneumatic Jarr Ram Turnover P.D. Moulding Machine.

Sand Mill, 6 ft. dia., Stationary Self-discharging Pan.

"Titan" Cupola, 4 to 5 tons; little used.

Brearley Type Sand Disintegrator.

The above are offered at LOW PRICES before removal.

S. C. BILSBY, A.M.I.C.E., A.M.I.E.E.,
215, Barclay Road, Warley, near Birmingham.
'Phone: Bearwood 1103.

FOR Sale, Denison Foundry Testing Machine for Tensile and Transverse Tests. In perfect condition. £35 net.—T. C. HOWDEN & COMPANY, 7, Fleet Street, Birmingham.

ELEC. Travelling Wharf Crane. All motions. Cheap.—A. MORGAN, 50, Wilkin Street, N.W.5. Gul. 1147

SAND BLASTING PLANTS FOR SALE

Tilghman Sand Blast Room, 6 ft. x 6 ft. x 8 ft. high.

Tilghman Rotary Barrel, 36 in. x 30 in.

Tilghman Rotary Double Barrel Plant, barrels 24 in. x 20 in.

Tilghman 4-ft. 6-in. x 3-ft. Cabinet Plant.

Tilghman 30-in. dia. Cabinet Plant.

Jackman Rotary Barrel, 30 in. x 24 in.

Each Plant complete with Sand Apparatus, Air Compressor and Exhaust Fan.

Large stock of FOUNDRY PLANT at LOW PRICES.

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'Phone: Bearwood 1103.

MORRIS Cupola Hoist with Steel Tower and Car.—A. MORGAN, 50, Wilkin Street, N.W.5. Gul. 1147.

THOS. W. WARD, LTD.

DUPLEX PUMP, Worthington Hori., 10" x 7" x 10", cap. 9,000 galls. per hr.
SINKING PUMP, "Evans" Vert. "Cornish" D.A., cap. 20,400 galls. per hr.
CUTTING-OFF MACHINE, 9" Rotary bar.
2 LANCS BOILERS, 30' x 8' 3", 150 lbs. w.p.

Write for "Albion" Catalogue.
'Grams: "Forward, Sheffield."
'Phone: 23001 (10 lines).
ALBION WORKS, SHEFFIELD.

MISCELLANEOUS.

SPRIGS (fine cut) at cut prices; 3 in. to 6 in., £11 10s. ton d/d any station England, or 11s. 6d. cwt., carriage extra.

Inquiries esteemed.

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PUBLICATION

RYLAND'S DIRECTORY of the Coal, Iron, Steel, Tinplate, Metal, Engineering, Hardware and Allied Trades. 1932 edition. Price 42s., bound in cloth.—INDUSTRIAL NEWSPAPERS, LTD., 49, Wellington Street, Strand, London, W.C.2.

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